ISASC

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Cover Picture

This British pendulum postal scale has cast, round its base, ELLISTON'S SELF-ADJUSTING BALANCE. The beam is formed as a snake, a very popular motif in 1839 and 1840. The brass is black-patinated, another feature commonly used around 1840, [although it is often, incorrectly, stated that black-patination only became fashionable after the death of Prince Albert in 1861]. The graduations are in 1/2oz divisions up to 5oz. Each *postage* was 1/2oz, and each multiple of 1/2oz needed a 4d stamp at the very beginning of the General Postal System, but was rapidly reduced to 1d stamp, a rate that continued in use until 1871.

The candle was used to soften the sealing wax that was dripped onto the letter or its envelope [after the envelope was invented]; the writer then wet his seal, or some other impervious small object, and pressed it into the warm wax to give the recipient a clue as to who sent the letter.

Elliston has not been traced, so to date this extremely rare scale accurately is impossible.

Courtesy of G & A Renton

Editor's Comment

Belgian member of ISASC, René van Nieuwerburgh, kindly pointed out that the hydrostatic scale shown on the Cover of EQM issue 4, 2002, bore the trade mark of H L Becker of Bruxelles.

ISASC
INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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Unknown CCD

BY E NEWMAN

Finding a previously unknown American gold counterfeit detector created in 1849 was like learning that an extinct species of animal is very much alive. This newly-located weighing device is distinctive in that it incorporates one swinging arm to accommodate some denominations of US gold coins, while the beam to which that arm is attached holds the others. Only a hint of its possible existence has been available, but that hint had been unnoticed. To understand the unique status of this device we first look at its predecessors.

Predecessors in U.S.

During the American colonial period and well into the first half of the 19th century in the United States, equal-arm balances in a pocket-sized box or case were used to test the weight of foreign coins in circulation. The results were compared to tables specifying the correct weight of the coins. The only other protections against counterfeits were careful observation and a simple vibration test (that is, a coin was either balanced and tapped or spun on a hard surface to check if it had a ringing sound.) Casting, alloying and plating of counterfeits steadily became more sophisticated and thus improved accuracy in testing became necessary. A counterfeit composed of other metals could also be increased in size (either diameter or thickness) to produce a proper weight in an attempt to deceive the tester.

Predecessors in England

Mechanics, rarely in England in the late 18th century and prolifically in the 19th century, had rarely developed pocket-sized brass balances containing two holders [platters] for the two current gold coins cut into the beam at proper distances on one side of the fulcrum and a fixed poise [counterweight] on the other side. The moment [tipping] created by either denomination of a genuine gold coin being tested would be the same and would balance the poise. Horizontal, circular holders of the exact circumference of a genuine coin were countersunk into the beam to test the diameter. A slot equal in width to the thickness of the genuine coin was cut across the diameter of each coin holder so that thickness could be checked. This was called a slot gauge. A chord, or arc, was commonly cut away from part of the circumference of each coin holder on opposite sides of the beam so that a coin could easily be lifted out of the holder with finger and thumb. The fulcrum on which the beam rested was mounted on a brass base and such a device was called a rocker because of its seesaw movement on the fulcrum. See Fig. 1.

Fig. 1. ⩓⩓ A typical English counterfeit coin detector, c.1830, made by the most prolific maker of such rockers. English rocker for the sovereign and ½ sovereign, made by Samuel Harrison, working 1825-1833. Courtesy D Crawforth-Hitchins

The first detector for U.S. gold coinage

The first American counterfeit coin detector (any mechanical detector is hereafter referred to as a CCD) copied such English principles and was produced in 1834 by T Moore of Philadelphia to test the U.S. $2.50 and the $5 of the new size and weight (III-2-4).[1] See Fig. 2. This device did not

check a U.S. $10 because no $10 U.S. gold coin had been struck since 1804 and other U.S. gold coins from earlier years had been withdrawn from normal circulation by banks because their intrinsic valuc was highcr than thcir face value. Moore's CCD was made with and without the name of the maker punched onto the poise. Sometimes the word PATENT appeared on the base even though no patent was ever issued. It was about 3.9 inches (96mm) in length and about 0.8 inches in height, so it readily fitted into the pocket or pouch.

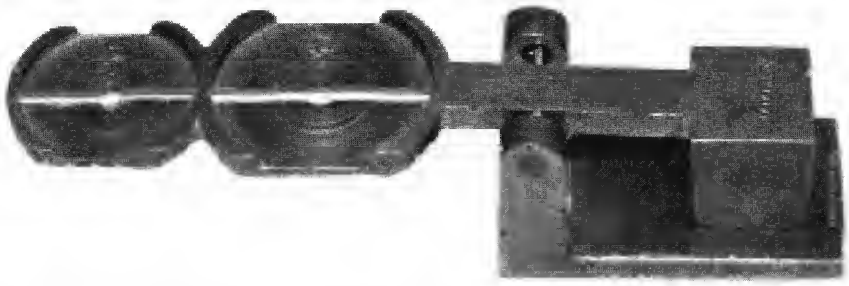


Fig. 2. ⅄⅄ Moore's Patent Eagle Balance of 1834, for the ½ eagle [U.S. $5] and the ¼ eagle [$2.50] coins.

Just prior to the major discoveries of gold in California in 1848, only three denominations of U.S. gold coinage had been struck: the $2.50 (quarter eagle), the $5 (half eagle), and the $10 (eagle). When large quantities of California gold became available for U.S. coinage, Congress authorized the Mint to add $1 and $20 denominations pursuant to the Act of March 3, 1849. At that time foreign gold coins circulated extensively in the United States, and counterfeiting and tampering had become a major problem. The modest amount of U.S. gold coins then in circulation was not substantially targeted by counterfeiters. But when production of U.S. gold coinage was to increase greatly and foreign gold coins in American circulation were to be phased out, immediate and improved protection was needed against counterfeit and underweight U.S. gold coins.

In 1849 however, the size of any new CCD became a problem because of the need to accommodate the five different gold coins ($20, $10, $5, $2.50, and $1) which were, or were about to be, in circulation. Thc $20 doublc cagle was 20 timcs thc mass of thc $1 gold piece. In order to use a rocker similar to Moore's or of an English type, the distance of the center point of the $1 coin holder would have to be 20 times farther from the fulcrum than the center point of the $20 coin holder to provide the same moment for balancing a full-weight coin. That would require a balance beam of about 15 inches long (obviously, to reduce beam length the $20 coin holder would be positioned as close to the fulcrum as practical). Making a pocket-sized CCD similar to previous rockers seemed unworkable. It was rcalizcd that placing thc coin-holdcrs on both sides of the fulcrum would allow the other end of the rocker to act as the poise. Alternatively, the rocker would require an adjustable counterweight or a sliding or separate poise.

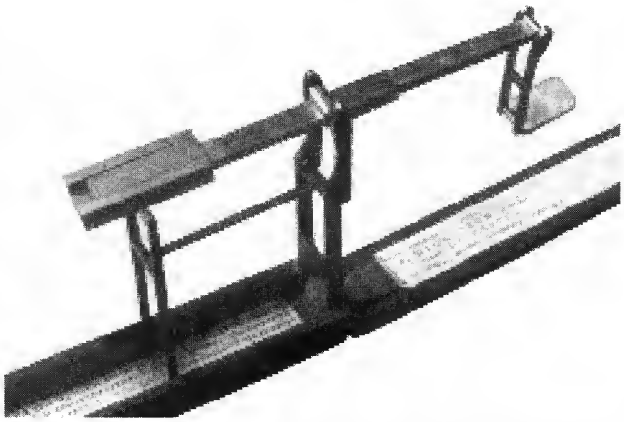


Fig. 3. ⅄⅄ Folding gold balance by Anthony Wilkinson of Kirkby in England, made before 1785. The turn away from the fulcrum for the guinea, and the turn towards the fulcrum for the half-guinea. A slide indicated the number of grains of gold lost from the coin.

Beginning in the 18th century, the English had successfully employed a single coin holder on one side of the fulcrum for weighing one of several gold denominations and attached on the top of the counterweight side of the fulcrum a small, swinging poise (or poises) on a horizontal hinge, enabling the moment for balancing to be changed manually by turning over one or more swinging poises 180 degrees on the hinge pin or pins. Any such poise was called then a turnover or a turn. See Fig. 3

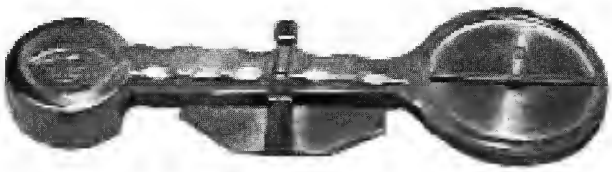


Fig. 4. ⋏⋏ Anonymous CCD for the $20 only. Made about 1849. The poise is stamped with an eagle with outspread wings.
Courtesy Bill Doniger

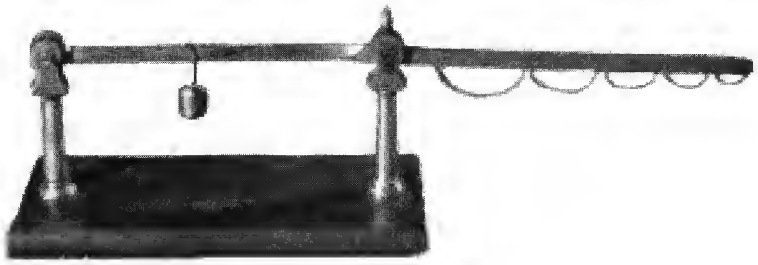
The impact of increased U.S. gold coinage

Several American mechanical designers during the period of 1849-1850 attempted to solve the American gold coin-testing problem in different ways. A rocker for only the $20 coin was produced (III-2-12). See Fig. 4.

K & G Howard of Philadelphia made a rocker limited to testing the $5, $2.50, and $1 denominations (III-2-17 and C 9). No photograph is available.

W N Snider, a machinist who worked for the U.S. Mint in Philadelphia, made a countertop gold coin scale for all five denominations using (a) combined thickness and diameter slots running end to end along the center line of the load side of the beam; (b) thin flexible metal straps beneath the slots to support the coins in a vertical position; and (c) a movable poise suspended on the beam and locating in the graduated notches on the other side of the fulcrum. See Fig. 6.

Fig. 5. ⋎⋎ Tabletop CCD by W N Snider. The end bracket, that prevents the beam from dropping too far, is a replacement.
Courtesy M A Murphy & M Spence



John Allender of New London, Connecticut, cut three smaller denomination coin holders into the beam on one side of the fulcrum and the two larger denomination coin holders into the beam on the other side of the fulcrum, but had to add a separate poise to fit into the $1 coin holder when the larger denomination coins were tested (IV-I-10). Fig. 6. Allender's device was about 8.5 inches (216mm) long, somewhat larger than the desired pocket size.

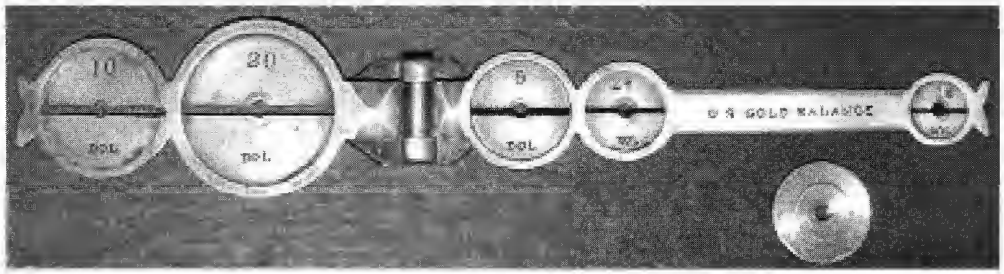


Fig. 6. ⋖⋖ Allender Gold Balance of 1850, with coin holders on each side of the fulcrum. Its separate circular poise was to be placed in the $1 coin holder only while testing the $10 and $20 coins.

The newly-discovered CCD, fig. 7, has two coin holders on its one swinging arm and its maker was identified only with a capital **H** punched in the top of that arm. Fig. 8. I attribute it to George Howard because the CCD punched with K & G HOWARD PHIL is very similar in shape and workmanship.

Fig. 7. ⩓⩓ The **H** CCD of 1849, showing the swinging arm partly raised.

The name of G Howard is first listed in Philadelphia directories in 1845 as a machinist at Broad and Paper Streets. In later listings the name became George Howard and then George C Howard. However, there is no K Howard listed in Philadelphia directories, but he may have been an older relative of George Howard. George Howard must have been very ingenious because he broadened the scope of his occupation to mechanical engineer as his business grew and he soon occupied three lots on South 18th Street below Market Street. He advertised in 1862 as a maker of tools for machinists, factories, railroad repair yards, etc. His listings ceased in 1880.

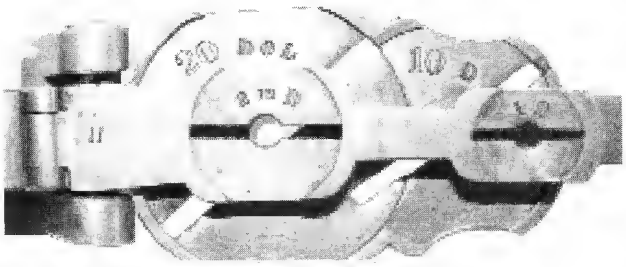


Fig. 8. ⩓⩓ Close-up of Fig. 7, the H CCD, showing the small H over the fulcrum. The 5 D holder is out of sight on the right.

Allender demonstrated his familiarity with the **H** CCD when he commented in his March 26, 1850 patent application:

I am aware that balances for proving coin have been made with two levers hung upon one fulcrum so arranged as to weigh all the coins upon one side of said fulcrum, and when the larger coins were weighed the lever in which the small ones are weighed is turned to the opposite side of the fulcrum. Therefore I make no claim to instruments constructed with more than one lever and to weigh upon one side of the fulcrum only.

There are some technical ambiguities in Allender's language as he attempts to distinguish his device from previous rockers:

(a) Two separate levers could be hung side by side on one fulcrum with different coin holders and would operate independently of one another.

(b) A swinging arm attached to or laying on top of a basic lever is only a part of a lever and not a lever itself.

(c) When a swinging arm is turned to the opposite side of the fulcrum the arm merely changes the movement on both sides and is still a part of the basic lever and performs no independent leverage.

What Allender intended to say was that he was not claiming originality for a swinging arm which enabled and required coins to be tested only on one side of the fulcrum but was claiming originality for his way of testing some denominations on one side of the fulcrum and other denominations on the opposite side of the fulcrum. The description (a) obviously referred to the **H** CCD that had

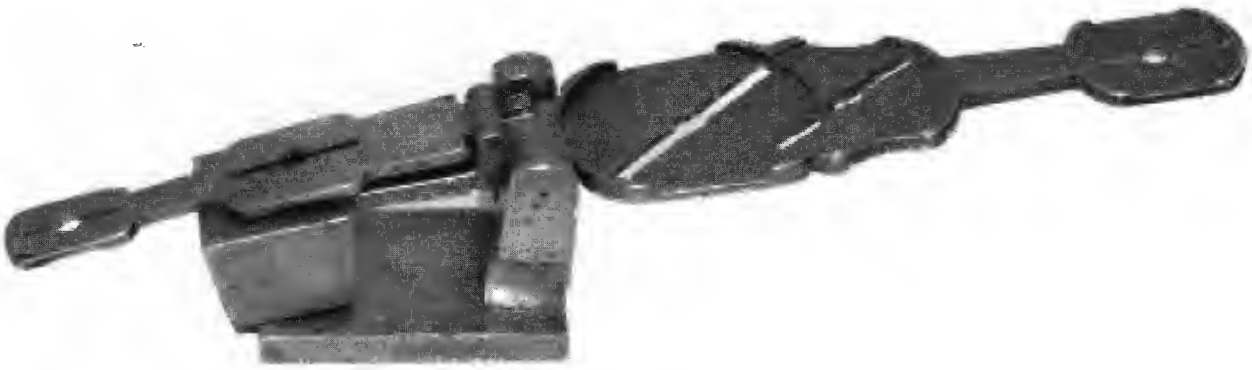


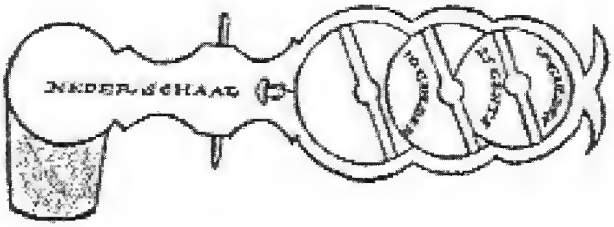
Fig. 9. ⋏⋏ The **H** CCD showing the single arm swung over to the left side, to increase the mass on the left of the fulcrum, and thus balance the 20 dollar and 10 dollar coins.

recently appeared. Allender's description of his earlier device was repeated unchanged in the language of the patent issued to him on November 27, 1855 (II-2-9A and IV-1-26).

The **H** CCD was and is revolutionary and distinctive because the swinging arm, that contained two of the smaller-sized coin holders, transferred the poise, in effect, from one side of the fulcrum to the other. (The turns used on earlier English folding guinea balances were small, were placed and normally remained after movement only on one side of the fulcrum, and never contained any coin holders.) When the swinging arm of the **H** CCD had its smaller-size coin holders facing upward, it covered some of the other coin holders on the beam below so that they were then blocked from use for testing. See Fig. 7. When that arm was swung over on its hinge across the fulcrum, its mass changed from one side of the fulcrum to the other and exposed the larger coin holders for use in testing. See Fig. 9. The hinge was attached to the beam almost over the top of the fulcrum.

Fig. 10. ➢➢ Although there is no evidence that Ellinckhausen's rocker of 1829 had been seen by any American, his solution for testing the diameter and thickness of coins of similar weight was the same as **H** used. He put the slots on the diagonal, and overlapped the coin holders. The Dutch coins to be tested were the 10 guilden, 25 cents and 5 guilden.

From M A Crawforth's *Sovereign Balances*



Therefore the mass of the swinging arm of the **H** CCD had to be arranged with precision because it performed a function on each side of the fulcrum. It was reasonably easy to adjust the moment of a balance beam by reducing the side that was too heavy by filing or buffing off some of its undersides, but, in the case of a swinging arm that was too light, the procedure became complicated. If the maker adjusted the poise side of

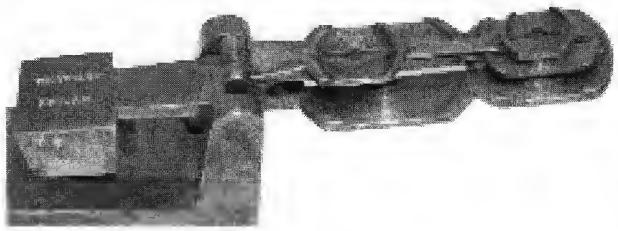


Fig. 11. ≺≺ Meyer's 1850 CCD showing its two swinging arms with their coin holders partly covering the beam's coin holders. When a $1 coin was to be weighed, the poise was largely balanced by the mass of the two swinging arms, plus the mass of the beam, so the added weight of one little dollar was enough to tip the rocker.

the beam on which the arm sometimes rested, a further adjustment of the beam on the larger coin holder side might be required. The mass of brass used for casting parts could not be relied upon because the countersinking of coin holders and the cutting of slot gauges and finger cut-outs resulted in substantial weight changes.

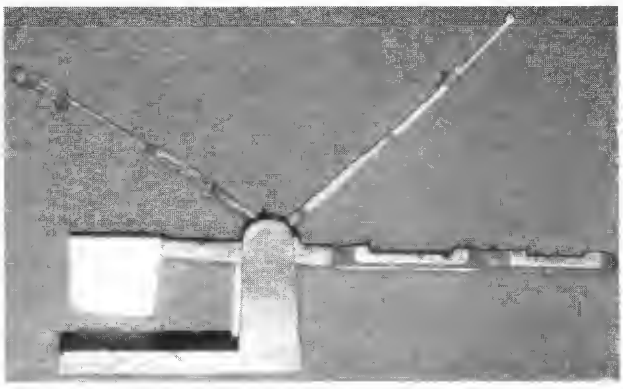


Fig. 12. AA F Meyers & Co's two swinging arms.

Thus, getting the arm equally accurate in both positions required careful handiwork, increasing the cost. To reduce the beam length, the **H** CCD crowded the $20 coin holder close to the fulcrum, causing the $10 coin holder to overlap the $20 coin holder and the slot gauges to be cut on the diagonal instead of along the center line of the beam, in the same way as Ellinckhuysen did on his Dutch rocker of 1829. See Fig. 10.

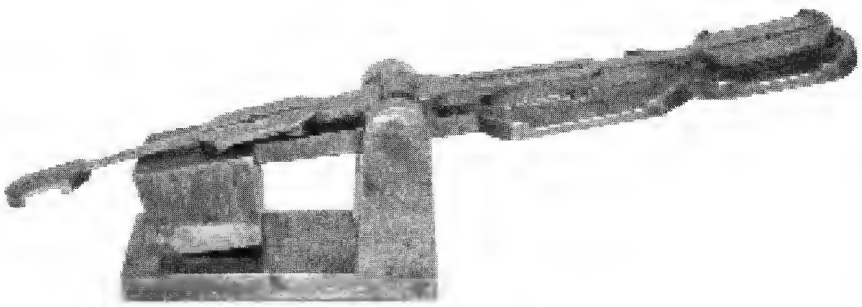


Fig. 13. AA F Meyers & Co CCD with the top arm swung over to the left. Because the slots of each arm align with those below, and those below are larger, it is possible to test the thickness of every coin while its holder is to the right.

Frederick Meyers (or Meyer, Myer or Myers) of Philadelphia promptly improved the **H** CCD by making the beam shorter; eliminating the overlap of the $10 coin holder over the $20 coin holder; and realigning the position of the diagonal slot gauges (III-2-13, etc.) This was accomplished by adding a second swinging arm to accommodate the $5 coin holder. See Fig. 11. The second swinging arm was on the same hinge pin that held the first swinging arm containing the $2.50 and $1 coin holders. The beam was shortened to accommodate only the $20 and $10 coin holders. This enabled the position of the $20 coin holder to be far enough from the fulcrum to eliminate the overlap with the $10 coin holder. Because Meyers had transferred the position of the $5 coin holder from the beam to a second swinging arm, the length of his device was shorter than the **H** CCD by about one inch (24mm). A more complex and desirable CCD was the result, but it required even more labor and adjustment than the **H** CCD.

Emphasis on low cost

Meanwhile Allender stressed the low cost of his CCD. He could have added a simple turnover without any coin holder on it to take the place of the separate weight he provided,

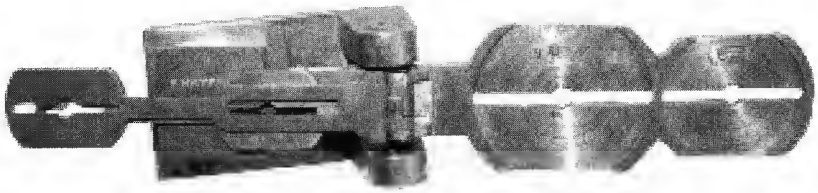


Fig. 14. AA F Meyers & Co CCD with both arms turned to the left. The 20 dollar and 10 dollar coins are so heavy that only the use of the poise plus the two arms provide sufficient mass to balance them.

since there was adequate space to do so on the smaller coin side of the beam between the $2.50 and $1 coin holders. Presumably he chose not to pursue that option because he was concerned about the production cost. In his patent application filed March 26, 1850, he stated:
This apparatus ean be made and sold eheaper than any other that will perform the same serviee with the same facility.

This cost factor was independently confirmed by a letter from the United States Mint to the U.S. Patent Office dated January 10, 1855 (IV-1-17), in which it is stated with respect to the price paid by the Mint for an Allender CCD: *The cost was trifling.*

The production costs of the **H** CCD and Meyers' CCD were far in excess of the cost of Allender's CCD. Allender continually sold large quantities of his device. For the two new coins minted in 1853, he added a second depression for the new $1 coin and for the $3 coin, a coin holder between and to one side of the $5 and $2.50 holders. For those who had purchased his detectors before the $3 denomination was coined, he sold a brass bush (of $2 mass) to fit into the $5 coin platter to enable $3 pieces to be tested. He also changed the punched-in lettering on the beam from time to time. His remarkable products are in many collections today.

The **H** CCD and Meyers' CCD are the only examples known of each device. This indicates that the public chose Allender's CCDs because of their price, even though they were too long to be carried easily in the pocket and in spite of the fact that the separate weight was often mislaid or lost. The rare survival of the **H** CCD and the Meyers CCD also indicates that very few of them were either made or sold. As is said in the medical profession, *The operation was a major suecess but the patient died.*

The reasons for and dates of production of many of the foregoing CCDs are confirmed by J R Eckfeldt and W E Dubois, assayers at the U.S. Mint, in their publications from 1849 through 1852 as follows:
As the balance is not a very portable or ready apparatus, several instruments have been contrived expressly for the purpose of combining the tests of weight and dimensions. They are all no doubt worth examining.

Is the **H** CCD really so rare as to be unique? Has anyone previously known of one? If so, I would be grateful to learn of it. On a "scale" of 1 to 10, the **H** and Meyers' CCDs seem to be 12s because they are so amazingly clever and distinctive. No coin holders on swinging arms have been reported attached to beams on any CCD elsewhere. The newly-found **H** CCD can now take a distinguished place in American numismatic, metrological and Gold Rush history.

Acknowledgements
Tom Serfass kindly took the pictures, while Eric was recovering from eye surgery.

References

1. Newman, E P, & Mallis A G, *U.S. Coin Scales and Counterfeit Coin Detectors*, self-pub, 1999.
2. Crawforth, M A, *Sovereign Balances, 1, Standard Rockers*, self-pub, 1984, revised 2001.

Eric Newman's Biography

Eric is an authority on American coins, so CCDs and coin scales are a subsidiary enthusiasm, developed with his friend, the late George Mallis. While George's health was failing, Eric encouraged George sufficiently to finish their book, THE reference book on U.S. Coin Scales and Counterfeit Coin Detectors.

Weights made of Silver

BY G ZAVATTONI

This short note was inspired by the purchase of a numismatic item described as a " silver Klippe", one of the many square cut coin weights you find mainly in Germany.

The *Klippe* was a silver coin weight for a quarter Hollandse Rijder, a gold coin of the Netherlands (see Houben *Muntgewichten voor Munten van de Neederlande*n n. 26,4 page 46). See Fig. 1.

Fig. 1. ⅄⅄ Quarter Hollandse Rijder

Silver weights are exceedingly rare and I have only one other, a Unite weight similar to W788. See Fig. 2. Withers quotes, in *British Coin Weights*, two additional silver weights: W710 for the Rose Ryal , see Fig. 3, and W 925 for the Double Crown.

The collection of the British Museum - apart from the Somerset box, W925 and a silver thistle crown weight- includes two Italian silver weights: a Doblon d'Italia and a Zecchino et Oiigaro both made in Rome under Pope Innocenzo XIII. (I am greatly indebted to Dr. Ward for the permission to see the BM collection).

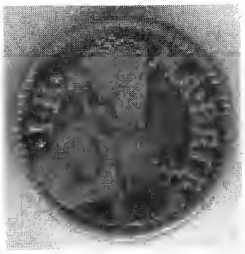


Fig. 2. ⅄⅄ British Unite weight

Another weight I have seen is in the collection of Paolo Borzone, bcing a Zecchino made in Rome under Pope Benedetto XIII.

A few others, including an exquisite set of nested weights, are mentioned by Houben.

Finally, thanks to the courtesy of Mr. Dhenin of the *Paris Cabinet des Medailles,* I was able to see a recent acquisition of theirs: a square silver weight for the British Angel weighing 4,92 grams (four deniers marc de Paris) and possibly made in the southern Low Countries in the XVI century. See Fig. 4.

Fig. 3. ⅄⅄ British Rose-ryal weight. Courtesy B & P Withers

The best series of silver weights were described by Sheppard and Musham in *Money Scales and Weights*, (p 29/30) and belongs to the so-called *Somerset box*, exhibited in the British Museum.

Weights belonging to the Somerset Box (some being later additions)		
James I Crown	Queen Anne fi Guinea	Louis XIV Pistol
James I Angel	1 Moidore	Louis XIV fi Pistol
Queen Anne Guinea	fi Moidore	18 Shilling
		9 Shillings

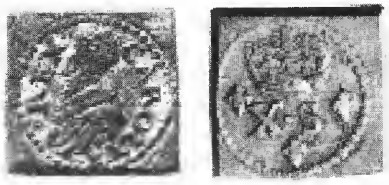


Fig. 4 ⅄⅄ Weight for the British Angel. Courtesy Paris Cabinet des Medailles

As it appears from the Somerset box, silver weights were made for very important people - the Earl of Somerset in this case, although it is difficult to imagine an Earl, or a Cardinal or the Pope himself in the case of Roman weights, making actual use of them, checking a coin being an *act of avarice* incompatible with the status of a *grand seigneur*. On the other hand the weights are accurate, so they are not just silver objects made utilizing the dies for the coin weights.

I would welcome the help of the readers of Equilibrium in order to expand my limited knowledge in this field.

Beginners' Guide Part 7

All pendulum scales have one distinctive feature. When the load is applied, a mass at the other end of the beam swings [pendulates] until equilibrium is achieved. If this were done with a straight beam, the mechanism would be unstable, and the load might fall, but if the beam is bent, the centre of gravity is below the fulcrum, and a reasonable stability is achieved with too great a loss of sensitivity. Nobody would use a pendulum scale when great accuracy is needed, but the speed at which they settle, and the consequent quick read-out, makes them useful for many purposes.

History of development

The person credited with inventing the pendulum scale is Leonardo da Vinci, as he sketched two variations in one of his numerous sketch-books, c.1500. See Figs 1a & b. The drawings are perfectly feasible, but it is not thought that the idea was taken up and used in practise. It is significant that Leupold did not illustrate pendulum scales in his book *Theatrum Staticum*, published in 1726. Leupold was extremely comprehensive in his over-view of balances available in Europe, and would surely have included a pendulum scales if he had ever seen one.

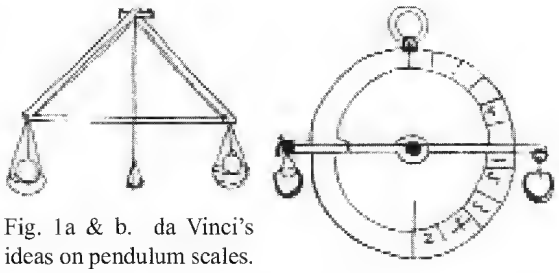


Fig. 1a & b. da Vinci's ideas on pendulum scales.

In 1758, the theory of pendulum balances was clearly demonstrated by Johann Heinrich Lambert in Germany. See Fig. 2. Ph. M Hahn too developed a pendulum balance with three load positions, and thus, three sets of graduations on the arc. See Fig. 3.

In Britain, the first known manufactured example was made by Anscheutz & Schlaff, using the 1772 patent of J S Clais, all three of whom, in spite of their Germanic names, were thriving in London. They made coin balances in close-fitting wooden cases, that allowed the user to read off the weight of the coin and any slight loss of gold very conveniently. They made a second variety that allowed the coin to be checked in air and in water, to ascertain whether the coin was made of pure gold. See Fig. 4. For King George III they made a dramatic circular dial version, with three pointers, to indicate the value of gold (presumably of gold coins), weight in Avoirdupois and weight in Troy ounces, a simplified version of the circular dial that Clais patented.

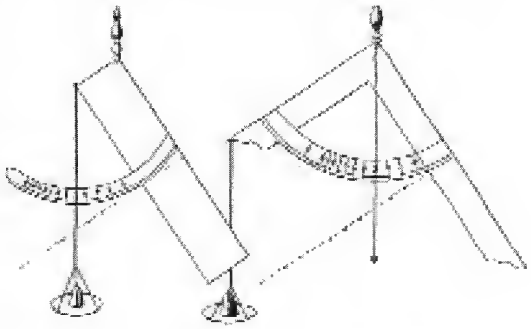


Fig. 2. ⋏⋏ Two of Lambert's developments of the principle of the bent lever.
Courtesy Mass & Gewicht p 899

The second pendulum scale known to be made in Britain was a chondrometer by Winnlaw, engine-maker in London, who died in 1797. See Fig. 5. His pendulum scale had to be balanced very carefully on the edge of the box, a most impractical method of supporting the scale, and that might explain why only one example is known.

Chester Gould patented a heavy-duty pendulum scale in 1807, but no examples are known even though he implies in the text of the patent that he made them. Gould fastened a long arm to a circular disc, and suggested four methods of using the scale - by moving the poise along the arm, by using poises of different mass, by repositioning the poise on a hook at 90 degrees to the normal position or by moving the fulcrum. What fun it would be to find an example of his 10 ton version!

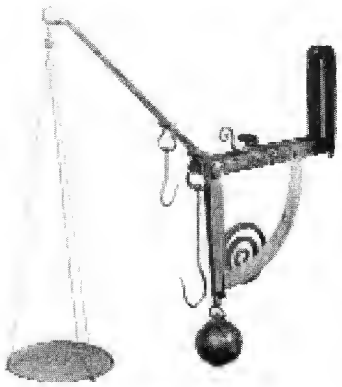


Fig. 3. ≺≺ Pendulum scale invented by Ph M. Hahn, made by A Hahn, c.1790. Ignore the decorative curl, which is not a spring. Three load positions, & three sets of graduations.

Fig. 4. ➢➢ Anscheutz & Schlaff 1772 hydrostatic coin scale with adjustable pointer.

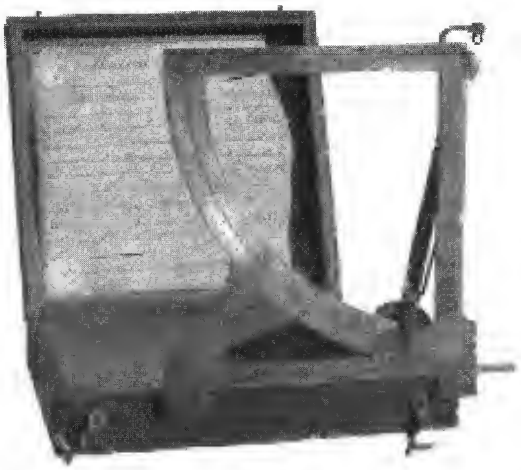


Fig. 5. ≺≺ Winnlaw's grain scale, c.1780, missing the thread that went through a slot in the tab sticking out, lower right, suspending the bucket below the box and the shelf on which it was placed. The poise arm could crash down when the bucket was lifted, so there is a flexure spring to 'catch' the arm as it descended.

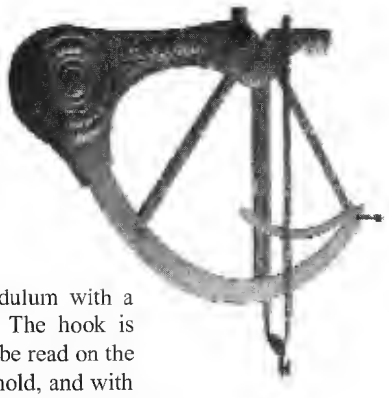


Fig. 6. ➢ Braby's 1816 trade pendulum with a movable shears for the load hook. The hook is shown in the pivot for heavy loads, to be read on the bottom set of graduations. Heavy to hold, and with the load hook easily displaced, this scale is better used hanging from a ceiling hook.

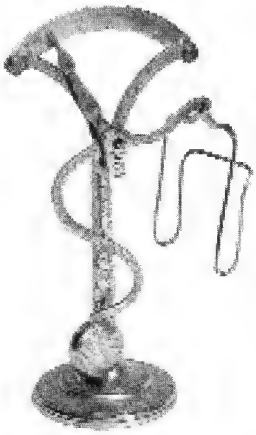


Fig. 7. ⅄⅄ Riddle's English postal scale of 1839, 7½ins tall. Gilt & engraved. A second version for coins is smaller and more compact.

The third English pendulum scale, made about 1816 by T Braby of London, is discussed in section 10l below, because of its rare design with three load positions. It was the first English-manufactured trade pendulum that has survived. Braby was a coach-spring maker, and accustomed to working in iron, so the scale was made of wrought- and cast-iron and only the graduated arcs were made of brass.

By 1838 pendulum scales were coming into designers' consciousness. W H James took out a patent for every principle of weighing then known, interestingly, including a pendulum scale on a pillar that is extraordinarily like Gabriel Riddle's postal scale, fig. 7, of 2 year's later, and he also patented a viable double pendulum scale. He even included a rack and pinion, only made much later, and a price-computing chart! A man ahead of his time!

The sudden enthusiasm for single pendulum postal scales, made of pressed sheet metal, in Germany, was amazing. See Fig. 13. Numerous variations were invented, patents were taken out from the late 1880s giving protection in USA, Canada, UK, Austria, Hungary, and of course, Germany, and hundreds of thousands were exported bearing the graduations for the different countries. They had the advantage of coming from a country with a relatively low cost of living, often using economical methods of production such as punched-out sheet and tabs to hold parts together, and folding flat for transport, so that they were very cheap compared to the robervals and

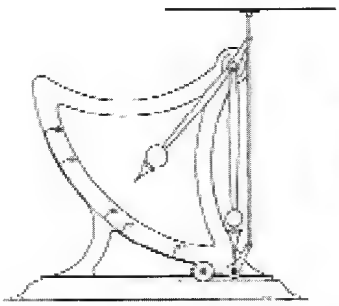


Fig. 8. ⅄⅄ Guérin's French postal scale of 1849, with his modification of a half-roberval linkage. The real pointer hangs vertically. The poise matches its design. Not many known..

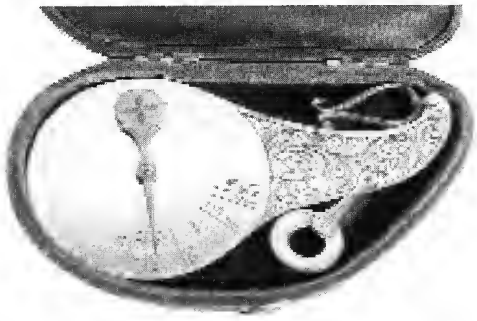


Fig. 9. ⅄⅄ N Hall had UK patent no 791 of 1863, and two or three pointer version no 543 of 1866. Made or retailed by Parnell, John Heath, Perry & Co, J Cooke & Sons and James Heeley & Sons. Much plagiarised as a cheap pocket scale.

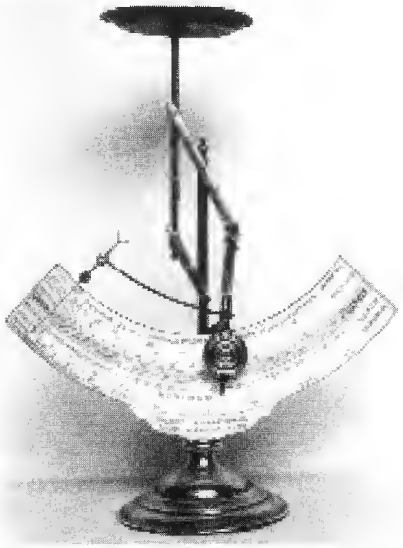


Fig. 10. ⅄⅄ Horn & Albracht took out UK patent in 1880 for a superb postal pendulum, that was made for use in Germany, the Netherlands, France and Britain. Courtesy R Kok

Fig. 11. ≺≺ Briais' French postal scale patented 1866. Compact scale's dial only 44mm (1¾ins) across. The graduations split into 2 sets, alternately read at top & bottom.

Fig. 12. ➢➢ Ragg's UK patent of 1871 & 1884. Patented in France by Restorf in 1885. Made by N Briais and by Marion in numerous decorative variations. Marion often added a ball to weigh down the connecting rod between the pointer and the twisting rod.

equal-arm scales otherwise available as postal scales.

Strikingly rugged cast-iron versions with scrolls, human figures and foliage were made by Gottlieb Kern & Sohn. See Fig. 14. Note that most German companies acted as wholesalers as well as makers, so catalogues of many other companies offered pendulum scales actually made by (for example) Ph J Maul or Kern, some still trademarked with the real maker's mark, but often offered without any marks.

Although the obvious use for a pendulum scale was postal, they were made also as egg scales, photographic scales, yarn balances, paper scales, coin scales, person scales and a few trade scales. Cylinder counter scales, more common in the USA than in UK, sometimes used a pendulum with cam and cord to rotate the price-indicating cylinder.

Pendulum scales were much used in the 1920s and 1930s for fan scales, although the first example seen in the UK was brought from the USA in 1906. Toledo Computing Scale Co got Board of Trade approval for their classic combined lever and pendulum counter weighing machine that had a price-computing fan chart. See Fig. 15. Avery took four years before they produced their own version in 1910 (without the added poise).

10. Standard Pendulum scales, hanging

Beam	Bent. Pivots not in straight line. MAIN FEATURE
Resistant	Fixed poise
Resistant	Of any mass suitable.
Fulcrum	Sometimes central, sometimes not. Fixed
Load	Fixed pivot
Stabilised by	Suspended from hook or fingers. Load below beam.
Graduations for equal units	Unequally spaced along arc.
Common names	Pendulum scale. Single pendulum. Inclination balance. Bent-lever scales.

The simplest versions have a pendulous pointer that always hangs vertically. The graduations are marked on the poise swelling, so that, as the load descends, the graduations move up behind the pointer.

10b. Standard Pendulum scales, with pillar or casing

Difference from 10: The beam is held by a linkage, often a half-roberval linkage, attached to a pillar, or attached to the casing.

Commonly, Americans boasted "No Springs", when the pendulum was concealed inside a casing. This was not so much because they trusted pendulums particularly, but more because they were suspicious of springs becoming slack.

It is necessary to check that the pillar or casing is vertical, so sometimes one foot has a screw to raise or lower one side, sometimes a plumb-bob is attached, or a line is drawn against an edge to indicate whether it is vertical (and the user has to adjust the scale with a wedge of paper or somesuch!) See Fig.s 8, 10, 12, 13, 14, 15, 19 & 20.

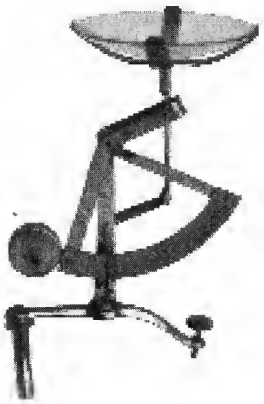


Fig. 13. ➢➢ Photographic or apothecary scale with glass pan. Stamped "Made in Germany. Deposé", so intended for export. Made of very flimsy sheet brass, with feet that can be turned through 90° for packing. Top comes off for packing.

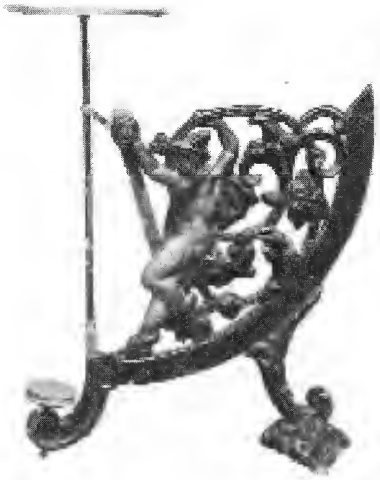


Fig. 14. ⮝⮝ The Germans made rugged cast-iron pendulum scales as well as thin sheet ones. Kern made lovely postal scales with elaborate figures such as this with Mercury, wearing only his winged hat and boots. Back view.

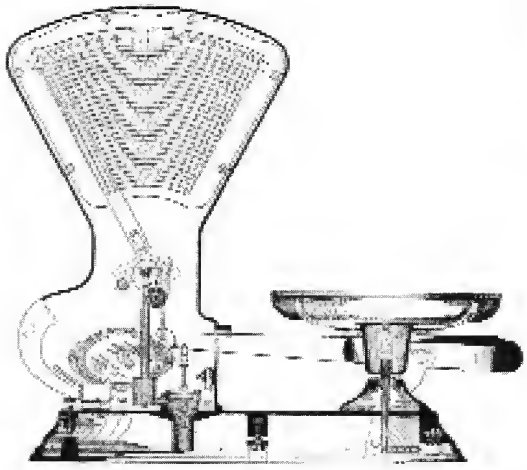


Fig. 15. ⮝⮝ Toledo Computing Scale Co 1906. The tell-tale bulge, into which the poise swings, is obvious. The 4oz slotted poise is slipped through a hole in the casing onto the rod of the pendulum. This doubles the capacity from 8lb to 16lb. The price chart only gives prices for the lower capacity, so the user must add the cost of 8lb to the price shown on the chart.

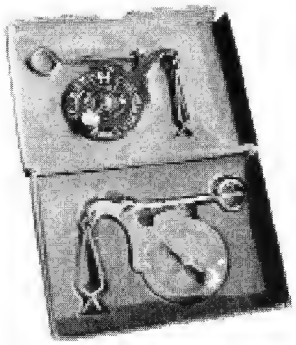


Fig. 16. ⮝⮝ Two tiny pendulum scales by G Hund of Paris, working about 1876-80. The top one, black patinated brass for the French market, 50mm (2ins) long, and the bottom one is brass with red letters and numbers for Industria Argentina graduated in Gramos. Both with pendulous pointer.

10c. Standard Pendulum Scales with fixed pointer

Difference from 10. The pointer is fixed, and thus can be adjusted relative to the graduated arc if desired.

The Anscheutz & Schlaff design of 1772 had a fixed pointer with a screw at the top that trapped the pointer against the pillar as it pointed at the zero position before use. See Fig 4.

There are many hanging pendulum scales with the pointer attached to the shears coming down from the finger loop. Often the lever is in the shape of a circular dial, but the basic principle of the bent lever can be understood if one starts at the pivot point for the load, draws a line to the fulcrum, then draws another line from the fulcrum to the centre of the mass of the poise. These imaginary lines describe a bent lever. It is easily seen in Fig. 21 as a bend of 120 degrees.

When the pointer is fixed to the pillar behind the graduated arc, it needs to curl round the moving arc to get the tip of the pointer indicating the graduations. Alternatively, the pointer comes through a slot in the graduated arc, and its whole length is seen in front of the arc. See Fig. 23. The pointer is sometimes fixed to the poise-arm. See Fig. 24, Testut's trade scale, with probably the longest poise-arm relative to the length of the load-arm, allowing very heavy loads to be weighed on a scale almost small enough to put in a pocket.

A modified version has no pointer as such. The graduated arc moves as the load descends, passing a datum point where the graduations are read. See Fig. 25.

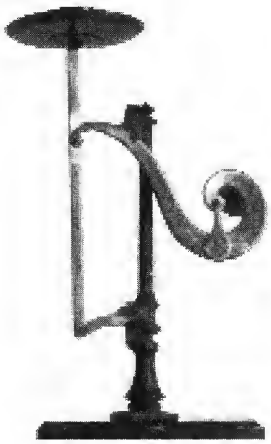


Fig. 19. ⮝⮝ The pillar version of the Pradel shown in Fig. 17. People paid extra for the pillar version, as it was easier to drop a letter onto a top pan than it was to slide a letter into a clip. Conversely, the clip version would fit in a pocket, conveniently.

Fig. 17. ⮜⮜ Pradel hand-held postal scale with a pendulous pointer. Pradel worked about 1865-70.

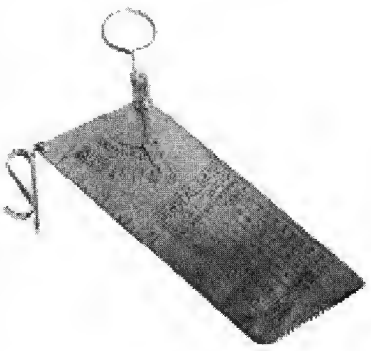


Fig. 18. ⮞⮞ Sav-a-stamp by Thorne-Foster Inc, postal scale of chromed brass. Rates for 1917.

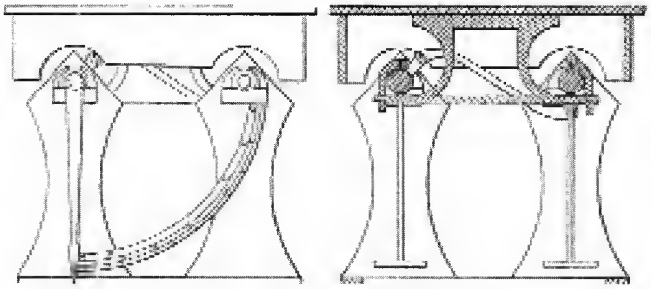


Fig. 20. ≺≺ Smyth's US patent of 1855 for a bent-lever platform scale. Smyth claims it to be the first pendulum platform scale. The whole structure is held by attaching the pivoting rods to the casing. Although there are two poises, they work in tandem, not in mirror-image, so they are not in the category below of bilateral pendulum scales. Note that the units are arranged so that the heavier the load, the wider the graduations, so it was more accurate at the heavy end. Was this interesting scale ever made?

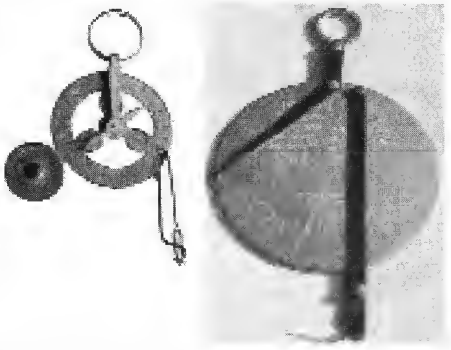


Fig. 21. ➢➢ This tiny French coin scale has 2 pointers attached to the shears, one pointing down left to the gold francs, & one going up right indicates 1/2, 1, 2 and 5 francs silver. Nickelled, made by Narcissé Briais, late 19th century.

Fig. 22. ➢➢ Aluminium circular postal Buddy Scale, St Louis, Mo. Graduations very large for lowest weight and very small for largest weights. Rates for 1924. Pointer fixed to shears.

10d. Standard Pendulum Scales with fixed graduated arc

Difference from 10. The graduated arc could as easily be fixed to the pillar or casing as the pointer could. As long as the one moved relative to the other, the result was the same.

If the graduated arc was fixed, the pointer and the poise were both attached to the bent lever as well as the load. Numerous versions of this were made, some of the prettiest using Ragg's 1884 or Restorf's 1885 patent. The French had many examples, as Narcissé Briais liked this type. See Figs. 26 and 27.

10e. Pendulous pointer + pendulous graduations,

Difference from 10. This is basically the same as the plain type 10, but instead of hanging from a loop held by the fingers, it is suspended from a pillar. Why did it take until 1909 for Ph J Maul to design this type?

The pointer does move relative to the graduated arc because the load pushes the bent lever, with the poise and graduated arc, but comes to rest, when not in use, vertically, under the influence of gravity, because the bent lever is hanging freely from the fulcrum point. See Fig. 28.

10f. Standard Pendulum Scales with damper

Difference from 10. A damper attached to the lever prevents it swinging far beyond the correct graduation point, and stops it rapidly.

Pendulum scales with fine bearings would continue to swing for a while, so needed a damper to rapidly reduce the oscillations. Some had an oil-filled pot with a flange, with a small hole in it, on a rod. The oil would seep through the hole in the flange and the rod, which was attached to the bent lever, slowed the oscillations. Others had a pot filled with liquid, with a paddle swinging through the liquid, again, slowing the oscillations of the lever. See Fig. 29.

Laboratory scales of such a crude principle would only be used to find out the approximate weight of a load

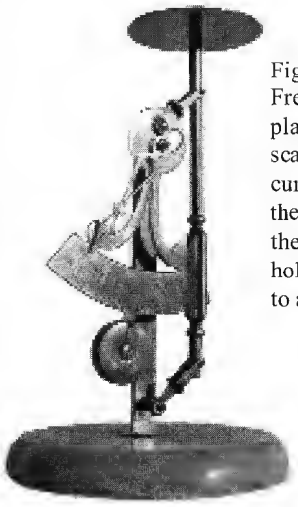


Fig. 23. ≺≺ French nickel-plated postal scale. Note the curved slot for the pointer, and the shuttered hole in the poise to add lead.

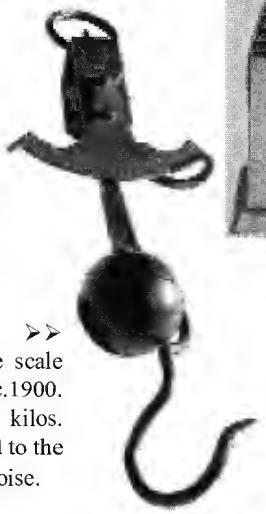


Fig. 24. ➢➢ French trade scale by Testut, c.1900. Capacity 30 kilos. Pointer fixed to the arm of the poise.

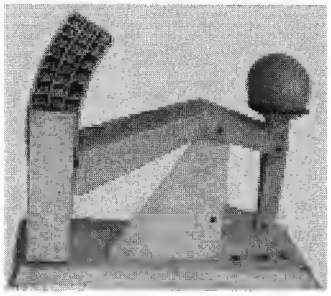


Fig. 25. ⩚⩚ US egg scale with moving graduated arc. No pointer. The graduated arc is read against the top of the plain metal rectangle on the left. Eggs graduated in Doz., Points and Each.

that was going to be put onto a precision balance for accurate weighing. By ascertaining the weight roughly, the user would set the expensive balance with nearly the right weights, and only need to do fine adjustments while the balance was loaded.

Users were highly suspicious of dampers, believing that they affected the reading of the true weight, so dampers only came into common use at the end of the 19th century. See Fig. 15.

10g. Standard Pendulum Scales Torsion balance

Difference from 10. A strong wire was used as a bearing.

Torsion laboratory scales, encased, with a circular dial, had the refinement of a fine wire twisting as the poise rises, instead of having a standard bearing for the fulcrum. (Makers never pointed out how far each side of vertical the bearing had to tip on a bent lever scale because it was not to their advantage to do so! The bluntness of the wedge as it moves away from vertical causes the bearing to be less precise, and to wear more rapidly and probably irregularly.)

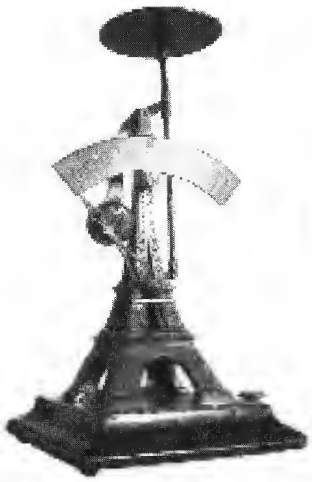


Fig. 26. ⅄⅄ Briais' French postal scale made to Restorf's 1885 patent.

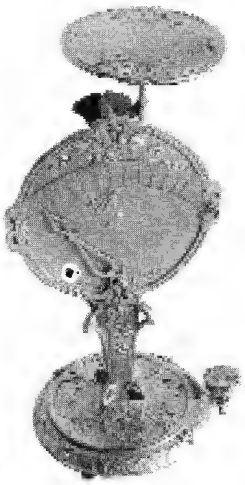


Fig. 27. ⅄⅄ Unnamed French postal scale to Restorf's 1885 patent. Beautifully gilded.

10h. Pendulum scales, with cam & cord

Difference from 10: The load is hung from a cord that wraps round a cam or section of a circle. This causes the point from which the load hangs to change as the load changes, so might be thought of as a moving load scale. If a quarter of a circle is used for the cam, the pivot does not move nearer or further away from the fulcrum so is not a moving load scale. See Fig. 30.

10i. Pendulum scale with more than one pivot point for the poise

Difference from 10: The poise either changes position in relation to the fulcrum automatically, or is moved manually.

A rare variation of this principle is the Rictus, a moving poise pendulum sc, with 'elbow' poise-arm. This cased pendulum has graduations widely spaced up to 50 grams, then closely spaced up to 250 grams, achieved by having the poise on a lever with a hinge in its middle. For lower loads, the poise hangs below the lever, then at 50 grams, the lever moves up to the point where the hinge catches on a projection and the lever becomes in effect much longer, pulling the poise up in a different arc. This is, in effect, a two-pivot-point poise. Fig. 32.

Flipping the poise on a hinged lever has the same effect as moving the pivot point. The mass of the poise is put nearer or further away from the fulcrum, thus balancing a small load or a greater load. Ph J Maul produced many versions.

Pegging the poise into the frame at different points from the fulcrum is an equally effective way of altering the range of the scale. Fig. 31.

10j. Pendulum scale with added poise

Difference from 10. By making the poise heavier, a higher range of graduations are used.

One has an extra poise that plugs into a hole in the small poise, raising the range from 0-4oz to 4-9oz. This is reasonably accurate, but depends on the loose poise not being lost! See Fig. 33.

The same applies to the one with a circular dial made by Blechemballage-fabrik, that they patented as a *Double-lever rotating pointer*, where double lever means that the extra poise transforms the leverage. Did customers complain about losing the loose poise? Is that is why they stopped making the extra poise? Fig. 34.

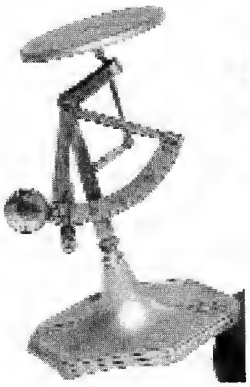


Fig. 28. ⅄⅄ German Ph J Maul 1909 patent. Tipped stand, plate and pillar, but the scale hangs vertically, reading correctly. Called the Fertig.

lab Fig. 29. ⅄⅄ Simple damper. The paddle in the cup slows the swings. German lab scale, capacity 40 grammes

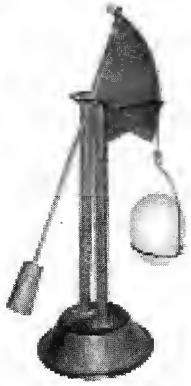


Fig. 30. ⅄⅄ UK egg scale by AC. The pivot-point is at the position where the cord leaves the cam.

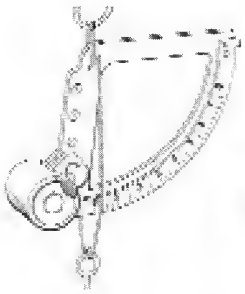


Fig. 31. ⅄⅄ Witherell invented the Arc household scale that was made in large numbers, and also this poise-moving type, that is not known to have been made. US patent of 1886.

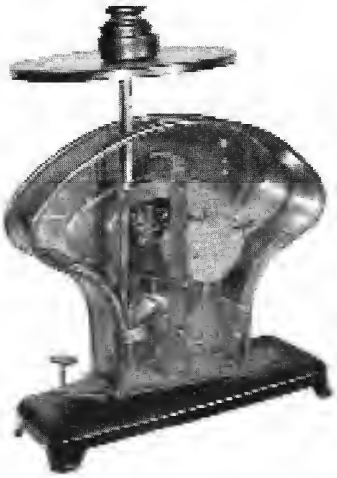


Fig. 32. ⅄⅄ German 1921 postal scale by Ph J Maul, the Rictus. The curved bent lever is just picking up the hanging circular lead weight.

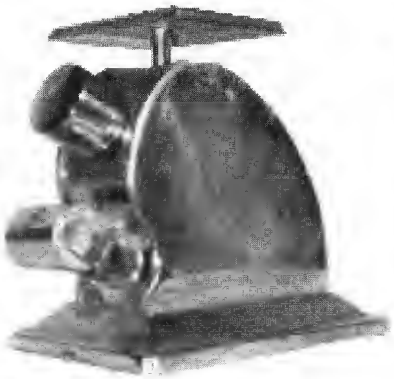


Fig. 33. ⅄⅄ The loose poise shown stored, pegged into its hole under the letter plate. Plugged into the lower poise, it raised the capacity. Made by Weintraub & Co for the UK market. Patented 1936. Very characteristically for the 1930s, brass chrome-plated.

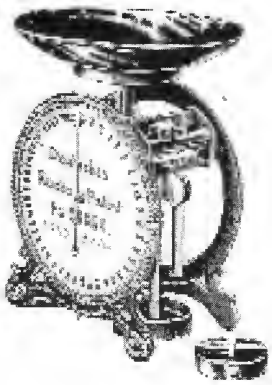


Fig. 34. ⅄⅄ The circular dial gave the units wide divisions, and the additional poise increased the capacity. German Blechemballagefabrik patent of 1884.

The Toledo counter scale was permitted by the UK Board of Trade in 1906, where an instruction was written on the scale "*When red weight* [sic] *is on pendulum, read red figures*". The slotted poise weighed 4oz, and was hung on the stem of the pendulum via a small window in the casing. See Fig. 15.

10k. Pendulum scale with multiple fulcrums

Difference from 10. The length of each 'arm' of the bent lever is altered by moving the fulcrum. An extra set of graduations is needed for each fulcrum position. Very rare method of raising the capacity. See Fig. 35.

10l. Pendulum scale with moving load

Difference from 10. The pivot point of the load is repositioned. Very rare principle.

There is no difference between moving the poise relative to the fulcrum and moving the load in order to change the length of the 'arms' of the bent lever but it is easier to move the poise, so this variation is very rare. As shown above in Fig. 3, Ph. M Hahn too developed a pendulum scale with three load positions, and thus, three sets of graduations on the arc. Braby also invented a rugged scale with three load positions. See Fig. 6.

Fig. 35. ⅄⅄ Two fulcrums extend the capacity of this US scale. Wetherill's cheap household Arc scale patent 1886. Courtesy J Berning

11. Bilateral pendulum scales

Beam	Two matching in mirror image. Pivots not in straight line. MAIN FEATURE
Resistant	Fixed poises
Resistant	Of any masses suitable
Fulcrum	Central. Fixed
Load	Fixed pivot
Stabilised by	Pillar. Two half-roberval or similar linkages.
Graduations for equal units	Unequally spaced along arc. MAIN FEATURE
Common names	Pendulum scale. "No springs". Lollipop scales. Double pendulum scales.

Some simple mirror-image pendulums were invented during the 19th century, a nice example being Batt's US counter scale, patented in 1880. The pillar has the load on a hanger sticking forward from the fulcrum. See Fig. 36.

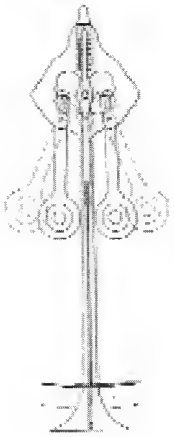


Fig. 36. ≺≺ Batt's US patent of 1880, implying that he was the first to invent a bilateral scale.

Fig. 37. ➢➢ A pencil sketch by N P Rockwell, showing a lollipop scale. Sold by Rowley Fine Art in 2003.

Fig. 38. ⩓⩓ Jacob Maul of Zell (JMAZ) produced more modern styles than Ph J Maul, but very little different in principle. 1938.

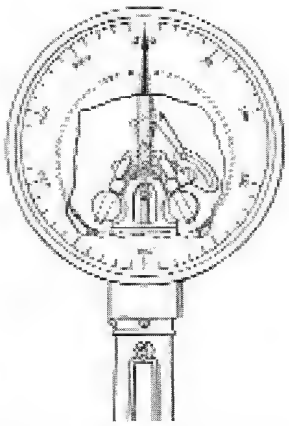


Fig. 39. ⩓⩓ 500lb lollipop scale granted B of T approval to A H Watkins of London in 1912.

The need for double pendulum scales was suddenly increased by Everitt's patent of 1884 for a coin-operated person scale. Particularly in USA, numerous striking designs for person scales developed over the first half of the 20th century, all triggered initially by Everitt's ideas. Person scales were easy to step onto, and many versions entertained the user by having a window through the dial so that the viewer could watch the parts sliding past each other until they came into equilibrium. See Fig. 37.

Bilateral pendulum postal scales came in many variations, both in the linkages beneath the top-pan, and in artistic detail. At least three companies made them in Germany, including Ph J Maul (who used the patent taken out by Firma Automat,) Balduin Heller's Sohne, and Jacob Maul. See Fig. 38. Note that G Hahn took out a UK patent for the same principle in 1902.

Ph J Maul's double pendulum was protected by US patent no. 815414 of 20 Mar 1906 and no 833922 of 23 Oct 1906, both patents taken out by P Frost. Ph J Maul used the patent taken out by Firma Automat, no. 167192 of 16 Sep 1904,

Jacob Maul of Zell made bilateral postal scales with the lever going to one side, then turning back, crossing the centre point and having the poise on the other side. This has the effect of making the contra-action very equal, and producing equal graduations. See Fig. 38.

Bilateral pendulums were much used for heavier loads in *lollipop* scales, that is, platform scales with a large round head containing a dial fronting a bilateral pendulum. Trade scales were easily read at eye-level while the load had only to be moved up and down a few inches from the floor. See Fig. 39.

Avery produced their version of a lollipop scale, the Aerostat Dial Weighing Machine, but gave it the dignified name of Stickig's principle. They got B of T approval in 1906.

11b. Moving graduations + moving pointer,

Difference from 11: The pointer and the dial counter-rotate.

This cunning design uses two extra levers that cross over the centre line, one pushing the pointer into rotation up on the left-hand side, while the other lever pushing the dial into rotation up on the right-hand side. By having the pointer moving contrariwise to the dial both on the same axis, each graduation is large and distinct. The scales are cheaply made, and seldom survive in good condition. See Fig. 40.

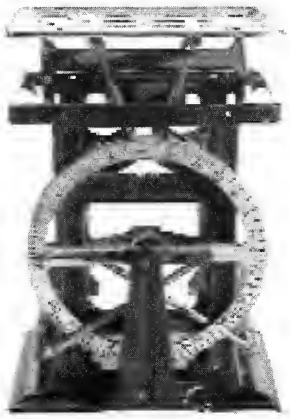


Fig. 40. German bilateral postal scale with counter-rotating dial and pointer, made for the UK market Patent 1911.

Variations and attachments

Pendulum scales sometimes have modifications to make them more convenient, (such as the dampers mentioned above) a catch to prevent movement in transit as seen on the larger Marion scales, a buffer to prevent the poise moving too far, again, on the larger Marion scales, or a second pendulum scale attached to the pillar on Ph J Maul's Exaktus postal scale with three sets of graduations.

Ohaus Numiscales

BY W DONIGER

Which came first, the chicken or the egg? In the case of this intriguing coin scale, I bought the documentation - a 4 page catalog and an operating manual - (the egg) at a paper show several years ago, but had never seen the scale itself (cluck cluck!) until I spotted this one smiling up at me from a dealer's table at a recent flea market. Now that I have both the scale and its specifications, I'd like to share what I have been able to learn about it.

This small but complex scale is one of two models produced in 1970 by the Ohaus Scale Corporation of Florham Park, NJ, for distribution by Paramount International Coin Corporation of Englewood, OH. Advertised as the *Model 1005 Numiscale Counterfeit Detection Balance*, it was designed for determining the specific gravity of coins, although it could be used for any small objects.[1] The base is 10ins (250mm) long, with the beam extending about 3ins beyond the base. A pan bow, suspended from the end of the beam, takes the coin pan and the buoyancy weight. There is a plastic water reservoir about 3ins in diameter. See EQM p 2188.

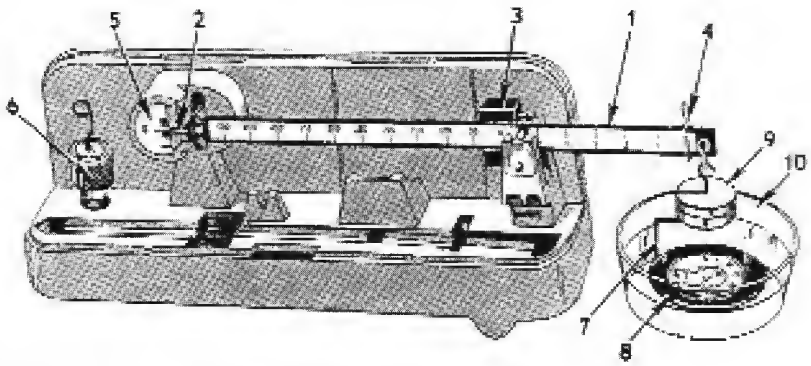


Fig. 1. ⅄⅄ Operating manual for the Ohaus 1005, discovered first.

Numiscale 1005

1 - Beam	5 - Dial Plate	9 - Buoyancy Weight
2 - Pointer	6 - Adjustable Foot	10 - Water Reservoir
3 - 500 Grain Poise	7 - Pan Bow	11 - Cover (not shown)
4 - 5 Grain Poise	8 - Pan	

The scale has a capacity of 1005 grains, sensitive to 0.1grain. The deeply-notched beam has 5 grain graduations and a 500 grain poise, with a dial at the left end of the beam divided to 0.1 grain graduations. At the other side of the fulcrum is a 5 grain poise. A 500 grain attachment weight is stored in the adjustment (leveling) knob. The scale is magnetically damped for fast reading. See EQM 2190.

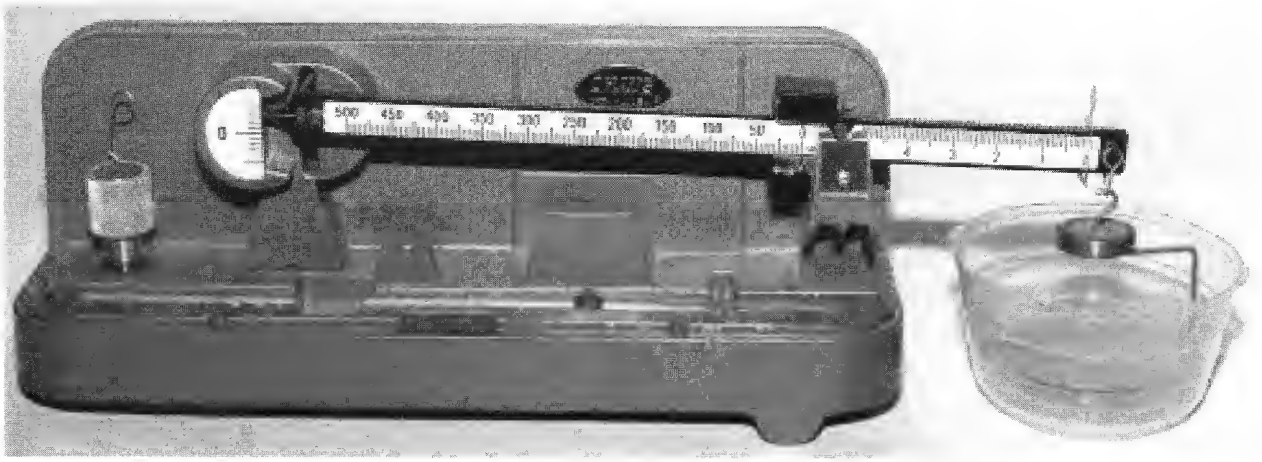


Fig. 2. ⅄⅄ Model 1005 Numiscale Counterfeit Detection Balance, discovered second.

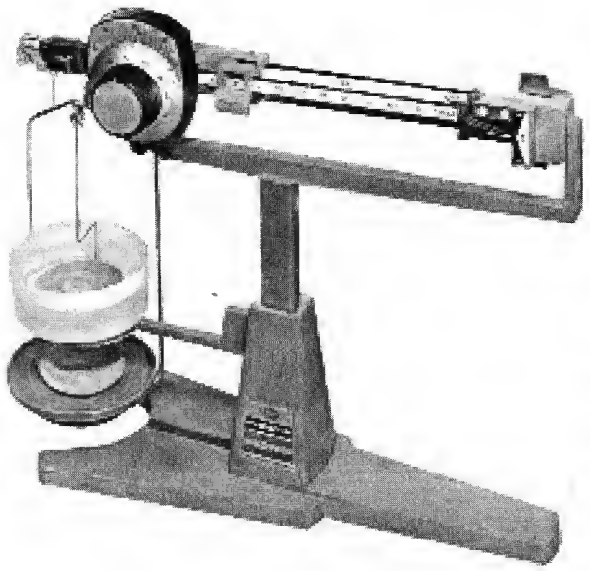


Fig 3. ⮝⮝ The 3100 Numiscale would weigh up to 17 gold sovereigns at one weighing or 15 silver rix-dollars.

Model 3100, Fig. 3, described in the catalog as the elite of Numiscale models, was developed for law-enforcement agencies and serious numismatists, parties vitally concerned with the detection of counterfeit coinage. Values of 100 grains or less are read on an engraved dial and vernier. There are two beams. One carries a 1000 grain poise and has 100 grain graduations. The other carrics a 2000 grain poise and has 1000 grain graduations. The total capacity of this scale is 3100 grains. Special features include agate bearings, heat-treated steel knives, and dust-proof bearing covers. Model 3100 was offered for sale at $75.00.

While the Numiscales were widely promoted for detecting counterfeit coins, that was not their only purpose. The rising price of silver in the 1960s produced a new kind of US coins and also a new group of collectors. The 90% silver content in US quarters and dimes ended in 1964 at a time when silver as metal was selling at $1.29 per Troy ounce.[2] Silver remained at that value through 1967 when a

The scale was designed to be dismantled when not in use. All its parts were stored in a two-piece case. My scale, unfortunately, is missing the cover. The maker recommended Model 1005 for beginning or casual hobbyists. It sold for $24.95. I have never seen another one like it.

Table of Specific Gravity Values for All U.S. Coins*

*From COWLES COMPLETE ENCYCLOPEDIA OF U.S. COINS by Mort Reed—1969.

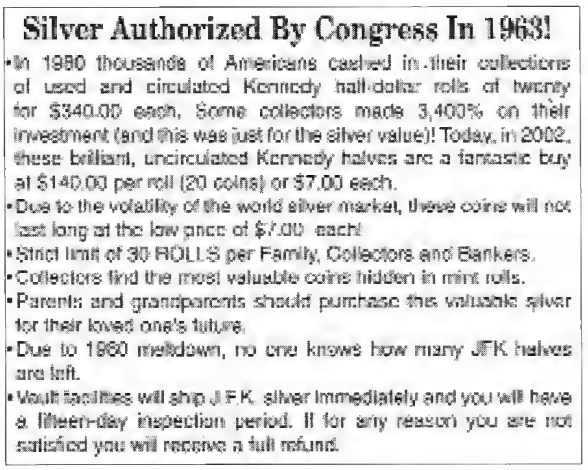
Denomination	Date	Specific Gravity Value
Half Cent	1793-1857	8.96
Large Cent	1793-1857	8.96
Flying Eagle Cent	1857-1858	8.95
Indian Head Cent	1859-1864	8.95
Indian Head Cent	1864-1909	8.72
Lincoln Cent	1909-1942	8.872
Lincoln Cent	1943 Steel	7.8
Lincoln Cent	1944-1945	8.868
Lincoln Cent	1946 1961	8.872
Lincoln Cent	1962 to date	8.868
Two Cents	1864-1873	8.872
Three Cents (Nickel)	1865-1889	8.945
Three Cents (Silver)	1851-1853	10.107
Three Cents (Silver)	1854-1873	10.337
Five Cents (Nickel)	1866-1942	8.945
Five Cents (Silver)	1942-1945	9.346
Five Cents (Nickel)	1946 to date	8.945
Half Dime	1794-1797	10.325
Half Dime	1800-1873	10.337
One Dime	1796-1837	10.325
One Dime	1837-1964	10.337
One Dime (Clad)	1965 to date	8.955
Twenty Cents	1875-1878	10.337
Quarter Dollar	1796-1838	10.325
Quarter Dollar	1838-1964	10.337
Quarter Dollar (Clad)	1965 to date	8.955
Half Dollar	1794-1837	10.325
Half Dollar	1838-1964	10.337
Half Dollar (Clad Silver)	1965 to date	9.572
One Dollar	1794-1803	10.325
One Dollar	1836-1935	10.337
All Gold Coins	1795-1859	17.3
All Gold Coins	1860-1933	17.2

Unalloyed Metals

Gold	19.32	Copper	8.96	Tin	7.298
Silver	10.49	Nickel	8.90	Manganese	7.3
		Zinc	7.13		

Fig. 4. ⮝⮝ *Specific gravity values of US coins. Taken from Cowles Complete Encyclopedia of U.S. Coins* by Mort Reed, 1969. Note that all the gold coins contained some other metal, as pure gold was not suitable for coinage.

steady rise began. The silver in U.S. silver coinage dated 1964 or earlier contained over 0.8 Troy ounces of silver per dollar face value and made it worthwhile to melt the coins for their intrinsic silver value rather than spend them for face value. Those who had such coins or found them in circulation often sold them in great quantity to dealers for three to five times face value. Bags, containers and piggy banks were emptied onto dealers' counters.


Silver Authorized By Congress In 1963!

- In 1980 thousands of Americans cashed in their collections of used and circulated Kennedy half-dollar rolls of twenty for $340.00 each. Some collectors made 3,400% on their investment (and this was just for the silver value)! Today, in 2002, these brilliant, uncirculated Kennedy halves are a fantastic buy at $140.00 per roll (20 coins) or $7.00 each.
- Due to the volatility of the world silver market, these coins will not last long at the low price of $7.00 each!
- Strict limit of 30 ROLLS per Family, Collectors and Bankers.
- Collectors find the most valuable coins hidden in mint rolls.
- Parents and grandparents should purchase this valuable silver for their loved one's future.
- Due to 1980 meltdown, no one knows how many JFK halves are left.
- Vault facilities will ship J.F.K. silver immediately and you will have a fifteen-day inspection period. If for any reason you are not satisfied you will receive a full refund.

Fig. 5. Part of an advertisement by a coin shop encouraging the search for JFK halves.

Dealers bought coin-sorting machines and coin-counting machines to speed the transactions, but by accident or on purpose some of the coins were coined after 1964 and lacked the silver content. The coins made after 1964 were the same size and design as the prior coinage but not the same weight. Thus, instead of inspecting the date on each piece, the coins could be weighed in bulk to determine whether pieces dated after 1964 were among those offered for purchase. A simple calculation comparing face value to weight would save individual inspection time. A scale calibrated to assist in this determination solved the problem.

Acknowledgement
With appreciation to Eric Newman for the detailed information on silver coinage.

Notes & References

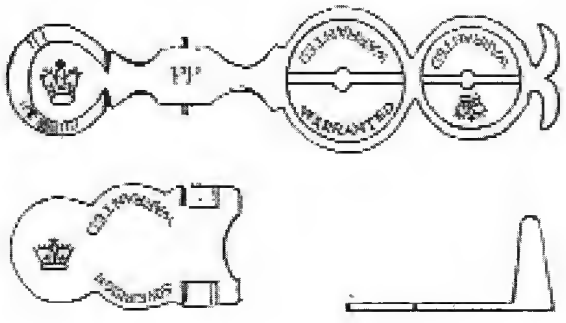
1. The specific gravity of all metal alloys is known. To determine the specific gravity of any coin, subtract the water weight from the air weight, and then divide the air weight by that sum.
For further discussion on hydrostatic weighing see EQM 268.

2. The half dollar, bearing John F Kennedy's likeness, retained 40% silver for the next four years, but other US coins were made of a copper-nickel combination.

P Poncia Rocker

BY G CHELLINGWORTH

I found a sovereign balance still in its case with a label proving it to be a very rare rocker. The red cap-end case is 3¾ inches long and has a green label. The rocker has no bushes to reduce wear.



P PONCIA'S IMPROVED SOVEREIGN BALANCE
To Weigh & Gauge Sovereigns and Half Sovereigns being so correct that no counterfeits can possibly go through the gauge of sufficient weight to turn the balance.

Editor; Collectors of English rockers will realise that this is the rocker wrongly identified in M A Crawforth's *Sovereign Balances, 1 - Standard Rockers*, as being by P Pontias.

Instructions to Make Coin Weights

Excerpts from the Calendar of Patent Rolls, kindly sent by N Biggs.

34 Edward 3. [1361] That the justices of peace, escheators [a person who confiscates on behalf of the King] and other persons to be assigned by the King, shall have post by commission to enquire of all falsifiers and counterfeiters of false weights, and to take them and imprison, and in prison hold them without mainpride, till they be acquitted or attainted and if they be attainted, their bodies shall abide in prison till they have made fines and ransoms after the discretion of the justices. And that the same justices have power thereof to enquire, hear, and determine, as often as to them shall seem necessary.

Dec 23, 1421. Commission to Bartholomew Goldbeter of London, goldsmyth, John Paddeslcic of London, goldsmyth, John Derlyngton, changer and assayer of the King's money within the Tower of London, and Gisbright Vanbranburgh, the King's sculptor within the Tower, in accordance with the ordinance in the last Parliament at Westminster at the request of the commons of the realm, to cause weights to be made for the noble, half-noble and faerling [farthing] of gold with rates necessary for the same, sufficient for each city, borough and market town of the realm, with all possible speed and bring them before the council, and to take any persons for the work, with power of imprisonment.

Feb 20, 1422. Commission to Bartholomew Goldbeter of London, goldsmyth, John Biernes of London, goldsmyth, John Derlyngton, changer and assayer of the King's money, and Gisbright Vanbranburgh, the King's sculptor within the Tower of London, to make weights ... and ten instruments called puncheons for each of the said weights, to be marked for greater security of the king's lieges, viz. five impressed with the sign of a crown on one part of the weights and the other five with the sign of floures de lys on another part of the weights.

Fig. 1. ⅄⅄ Sketch of a noble weight, showing the crown and fleur de lys. 19mm diameter. The half-noble and farthing [quarter noble] look the same, but the dimensions are smaller. See Withers *British Coin Weights*, Llanfyllin, 1993, p 12-13 for other examples.

March 5, 1423. Appointment, by the assent of the council, of John Bernes of London, goldsmyth, to the exclusion of all other persons, to make good and lawful weights of the noble, half-noble and farthing of gold, with the necessary rates and to mark them with a fleur de lys and a crown to be engraved in the manner ordained in Parliament at Westminster in the 9th year of Henry V.

Oct 12, 1423. Appointment, by assent of the council, of John Bernes of London, goldsmyth, south of the Trent, and Robert Curteys of York, mercer, north of the Trent, to make steelyards [stateras] and good and lawful weights of the noble, half-noble and farthing of gold with les rates necessary thereto, and to mark them with a fleur de lys and a crown, to be graved in the manner ordained in the Parliament held at Westminster in 9 Henry V. Any other person found making such steelyards or weights will be subject to a penalty to be ordained by the council, but the said John and Robert are not to take more than 4d for each pair of steelyards, and 2d for each weight of the noble, half-noble and farthing of gold, with les rates necessary thereto.

Editor: 2d per weight was a very high price, so extremely profitable to the monopolists! The original texts were in Latin, and we must wonder whether the "steelyards" were, in fact, equal-arm beams to be used with the weights.

US Patents 1877-1879 TEXT BY R HENDRICKS WILLARD

CAPTIONS BY D F CRAWFORTH-HITCHINS

Without a doubt, the most significant trend in US inventions during this time was the large number of patents for Counterfeit Coin Detectors, referred to as CCDs. These are usually quite small, relatively simple mechanisms of the so-called rocker type. This is essentially a steelyard having a fixed fulcrum and a series of one or more slots or pans to receive the coin on one arm, to be

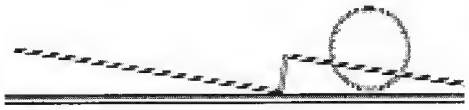


Fig. 1. ⮝⮝ J A Thompson patent no. 187,936 The simplest CCD, with 4 slots.

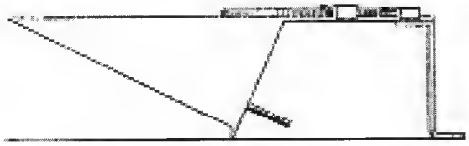


Fig. 2. ⮝⮝ J Wiarda's patent no. 188,712. CCD for two coins, with tabs to locate on the right of the point of balance. If the coin is too light the CCD tips & the coin slides off. The set-screw sticking out diagonally can be altered to take other silver coins.

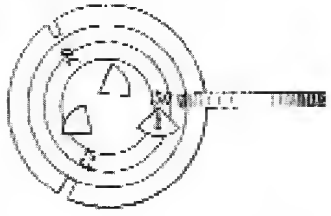


Fig. 3. ⮝⮝ J W Sutton's patent no. 188,982. The metal is turned down in 3 places to make crude fulcrums for coins placed in 3 slots that indicate thickness. The circles indicate diameter.

Fig. 4. ⮝⮝ J A Thompson's patent no. 189,284. He shows two variations, both with the distinctive hooks to hold the coins.

balanced against a fixed counter-poise on the end of the other arm. And how does this apply to detecting fraudulent coins? Basc mctals have a specific gravity lower than that of gold and silver. Therefore, if a counterfeit coin has the same diameter and the same thickness as a genuine coin, its weight must be less than that of the genuine coin. Or if the weight is the same as the genuine coin, then either the thickness or the diameter must be greater than that of the genuine coin.[1]

We know of only eleven US CCDs before 1875. The earliest known CCD in America was a cast brass rocker 81mm (3¼ins) long, with cut-out circular pans marked ½ and ¼ respectively, for the half and quarter eagle gold coins. Though no patent has been found, it was advertised in the *Philadelphia Trade News* of Nov. 8, 1834, as Moore's Patent Eagle Balance. See EQM 2832.

CCDs signed by Meyers, Howard, and Troemner but without known patents appeared on the market around 1850. US patents were issued for seven other CCDs between 1853 and 1862. There are none at all from 1862 to 1875.[2]

Fig. 5. ⮝⮝ P Doherty's patent no. 192,241. CCD for ½ and ¼ silver dollars or gold coin. Silver still preoccupied the patentees, so that the reference to gold was very much an afterthought..

Fig. 6. ➢➢ E Kronenberg's patent no. 195,451. The box has two slots in the top, for the ¼ and ½ silver dollars. Kronenberg does not even suggest the checking of gold coins! The coin depresses the rocker if it is full weight, and drops down and out of the slot in the bottom left of the box.

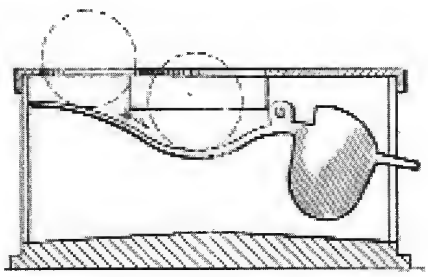


Fig. 7. ➢➢ W H Rice patent no. 196,168. CCD for use in tills. Simple rocker with several tubes guiding the coin down to press on the rocker at increasing distances from the fulcrum. Only to be used by the till-operator who chose the correct tube to check the diameter, and who rejected the buttons and washers that bedevilled coin-op operators.

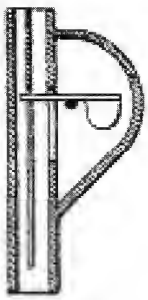
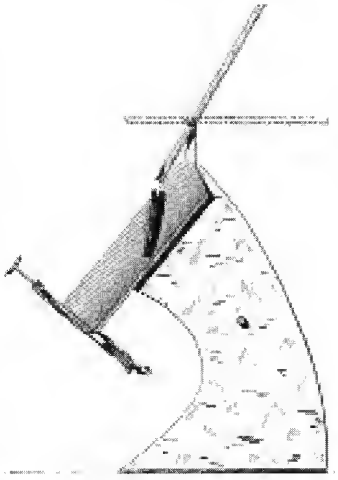


Fig. 8. ➢➢ J W Meaker's patent no. 200,080, CCD with a row of storage tubes for low value silver coins, with checking for diameter & thickness in the tube, and a primitive rocker hinged above each tube to check weight.



As an aside, cash registers of the era invariably had a marble or glass "shelf" above the cash drawer. This was often used as a convenient place to drop coins to "ring-test" them before putting them in the cash drawer, a low tech and less expensive alternative to the CCDs.[3] And then came the deluge. Beginning about 1875, CCDs by eight known makers appeared on the market but without any record of patents. Between Feb. 27, 1877 and Feb. 24, 1880, seventeen more CCD patents were issued. What caused this sudden panic? Finding the answer took some digging. Counterfeiting is as old as coins themselves, and considered a serious offence in every culture. In ancient times, counterfeiting the coin of the realm was usually considered treason, punishable by death, yet counterfeiting continued, despite all the sophisticated efforts of governments to eradicate it, and conditions in the 1870s were just right for counterfeiters to prosper.

On February 12, 1873, after several years of study and debate filling hundreds of pages in the *Congressional Globe*, there was a general revision of the coinage laws. The result was widely considered a clumsy attempt and a failure, causing the law to be dubbed *the Crime of '73*. One consequence of the bill was the actual elimination of the silver dollar!. This in effect demonetized silver and committed the country to the gold standard and caused the silver mining interests to begin a constant, bitter struggle for the return to bimetallism. But the Law of 1873 did not stop there. It also affected the status and physical properties of the other individual coins.

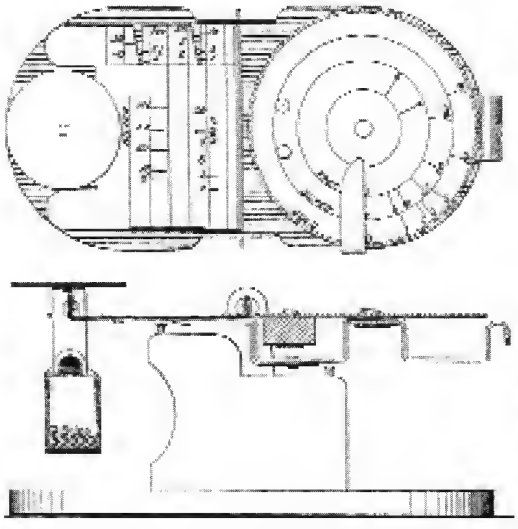


Fig. 9a & 9b. ⋏⋏ H Maranville's patent no. 203,057, his third patent for a CCD, and his fourth patent. This is a postal scale and CCD. The big plate rotates, so that the lead poise beneath its surface is gradually moved away from the fulcrum, giving precise readings. Schickert's principle keeps the coin/letter plate vertical. This is the first patent that specifically mentions gold coins.

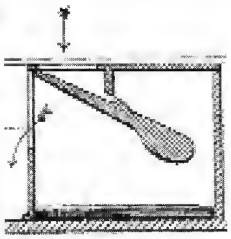


Fig. 10. ≺≺ S A Field's patent no. 203,719, a CCD for ten coins. A box contains ten rockers, each with a storage box beside it, to store full-weight coins.

Fig. 11. ➢➢ E Lueders' patent no. 205.492. CCD looking like a pen. The cap is pulled, to swing the scale to right-angles with the 'pen'. This version has a moving fulcrum so is a bismar. The other version shown has an inner tube that extends the steelyard so is a moving load scale.

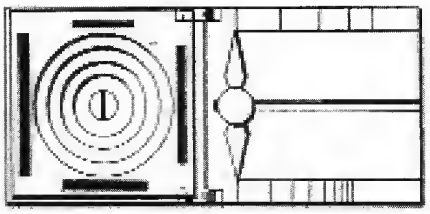


Fig. 12. ⮝⮝ E Street's patent no. 209,145. CCD top view of rocker, showing coin-plate with depressions to gauge coins. The poise slides along under the slot, and the pointer indicates the true weight. Can be used to weigh letters also.

Fig. 13. ➤➤ T C Miles' patent no. 209,180 CCD and letter scale in a pencil case.

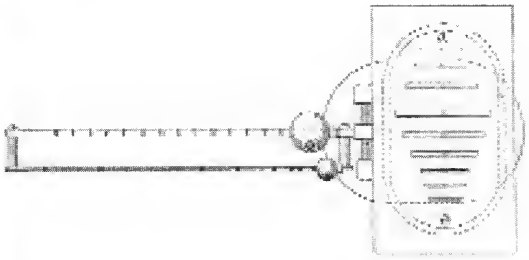


Fig. 14. ⮝⮝ G Hoag's patent no. 216,184, CCD & letter scale. It looks like a standard Fairbanks' postal steelyard, until the slots in the plate are seen. The 9 slots check the thickness & diameter of the coin, which should drop exactly halfway into the slot. The larger poise is moved along for the gold coins, and the small poise for the silver coins.

Fig. 15. ⮝⮝ J A Thompson's further thoughts on CCDs! Patent no. 224,807.

The weights of the half-dollar, quarter, and dime were altered slightly and arrows were placed at the date for the ensuing two years to indicate the difference in weight. Meanwhile, there had been tremendous improvement in the technology of casting and of mixing metals. Counterfeit coins were virtually impossible to recognize by sight, and people were getting jittery. Some of the CCDs patented at this time had slots for silver coins only up to half-dollar.

By 1878, the efforts of the silver mining interests bore fruit. The Bland-Allison Act, of Feb. 28, 1878, authorized the Secretary of the Treasury to buy two to four million dollars' worth of silver bullion every month to be coined into silver dollars. Inventors began patenting CCDs with additional slots for the dollar. The Specie Resumption Act of 1875 stimulated production of gold coins in redemption of greenbacks after January 1, 1879.[4] One famous counterfeit was the new V *centless* nickel of 1882. This was about the size of a $5.00 gold piece, prompting some enterprising people to gold-plate them and pass them off as gold. Needless to say, the mint added CENTS below the V in short order. A sprinkling of CCD patents were issued well into the 1940s. Although CCDs are now primarily a collectors' item, their mechanisms have been adapted to become the coin-receivers for the pay-telephones, launderettes, and vending machines of today.

Notes & References

1. All base metals have a lower specific gravity than gold. The same is true of silver, except for lead, which is heavier than silver. In the case of lead being used in a coin, the *ring* when the coin strikes a hard surface usually reveals it as a counterfeit, without any further testing. Newman, Eric P. and A. George Mallis. *U.S. Coin Scales and Counterfeit Coin Detectors*. LCC No 91-0911329, 1995.
2. Conversations with Eric Newman and John Shannon.
3. Withers, P, pers com.
4. Yeoman, R. S. *A Guidebook of United States Coins*. Racine, Wisconsin: Whitman Pub Co, 1963
5. Special thanks to Jan Berning for her assistance in preparing the patent list.

Editor; Due to shortage of space, a lot of extremely interesting patents are not illustrated that should be seen.

Patents sorted by date, (shop/warehouse platform scales and smaller). 1877-1879

NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
187,936	Feb 27, 1877	J A Thompson	Chicago, IL	F M Smith	CCD
188,712	Mar 20, 1877	J Wiarda	Green Point, NY		CCD

NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
188,982	Mar 27, 1877	J W Sutton	New York, NY		CCD
189,284	Apr 3, 1877	J A Thompson	Chicago, IL		CCD
189,976	Apr 24, 1877	J J Vereckler	Chico, CA		Swivelling platform
190,262	May 1, 1877	J G Vallentine	Florence, MA	self & E Vallentine	Beer scale
190,824	May 15, 1877	G H Chinnock	Brooklyn, NY	L N Mowry & Co	Spring family scale
191,910	June 12, 1877	J W Wood	Loami, IL		Light for beam on shop sc
192,207	June 19, 1877	E M Whyler	Hays, KS		Scoop with shot container in foot
192,241	June 19, 1877	P Doherty	Philadelphia, PA		CCD
192,574	July 3, 1877	R Ehmer	New York, NY		Spring & lever counter sc
193,276	July 17, 1877	J Parnall	Bristol, UK		Counter beranger
193,576	July 24, 1877	A Turnbull	New Britain, CT	Landers Frary & Clark	Spring counter sc
193,634	July 31, 1877	E J Bliss	Boston, MA	self & S M Brown	Anti-drip platform scale plate
193,744	July 31, 1877	G D Wyckoff	Indianopolis, IA	J A Green	Ruler; letter scale
194,983	Sep 11, 1877	D A Beam	Newark, NJ		Wheelbarrow with weigher
195,112	Sep 1,1 1877	F Fairbanks & L G Spencer	St Johnsbury, VT	E & T Fairbanks	Platform cloth sc
195,432	Sep 18, 1877	H Benedict & B A F Greer	Mount Vernon, OH		Rotating sleeve on beam, pricing
195,451	Sep 25, 1877	E Kronenberg	Philadelphia, PA	H Baldwin	CCD
196,168	Oct 16, 1877	W H Rice	New York, NY		CCD
196,245	Oct 16, 1877	M L Mery	Chico, CA		weighing scoop
196,434	Oct 23, 1877	G H Chattilon	New York, NY		shop candlestick with taring pointer
196,519	Oct 30, 1877	D L Columbia	Chicago, IL		grain steely'd, rotating sub-beam
196,703	Oct 30, 1877	C M Rider	Newark, OH		taring & recording steelyard
196,865	Nov 6, 1877	C L Bellamy	Arlington, NJ		dial face spring bal to ensure accuracy!
197,190	Nov 13, 1877	H M Weaver	Mansfield, OH		pendulum scale
197,489	Nov 27, 1877	C Onslow	Port Ewen, NY		platf'm, flexible bands & steelyard
197,618	Nov 27, 1877	M S Drake	Newark, NJ	H C Dean	household candlestick
197,938	Dec 11, 1877	F H Lindsley	Dover, NJ		butchers' spring bal on overhead bar with lead shot in hook
198.009	Dec 11, 1877	R Ehmer	New York, NY		spring & lever platform sc improvements
198,364	Dec 18, 1877	F Fairbanks	St Johnsbury, VT		small, grain Cornometer
198,365	Dec 18, 1877	F Fairbanks	St Johnsbury, VT		balance ball for counter robervals
198,575	Dec 25, 1877	C L Crowell	Rockdale, NY		Rocking lever scale
198,815	Jan 1, 1878	N H Putney	Bridgeport CT		druggists' pendulum
198,877	Jan 1, 1878	F Fairbanks & T Spooner	St Johnsbury, VT	E & T Fairbanks	calculating pasteboard steelyard
199,356	Jan 22, 1878	W B Daniels	Harlan, IA		counter or wagon weighing scale
199,776	Jan 29, 1878	C Becker	New York, NY		roberval counter sc, European bearings
200,080	Feb 5, 1878	J W Meaker	Chicago, IL	self, H B Merrell T Furguson	CCD
200,386	Feb 19, 1878	C A Fredericks	Brooklyn, NY		Spring & steelyard counter sc
200,708	Feb 26, 1878	J A & J S George	Bridgeport, CT		Pocket round spring bal
200,765	Feb 26, 1878	W B & J S Ross	Nashville, TN	selves, E R Campbell &	Double flexure spring postal sc H Harrison
201,604	Mar 26, 1878	J L Follett	New York, NY		Pendulum & steelyard connected

NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
201,972	Apr 2, 1878	G R Williams	Dardanelle, AS		Wheels for bale weighing steelyard
202,800	Apr 23, 1878	T Fairbanks	St Johnsbury, VT		Druggists' dispensing steeyard
202,807	Apr 28, 1878	C Forschner	New York, NY		Spring bal. with sliding outer tube
203,057	Apr 30, 1878	H Maranville	Akron, OH	self & S D Stewart	Postal sc & CCD
203,290	May 7, 1878	A B Pearson	St Louis, MI		Glass face for steelyard & spring bal
203,563	May 14, 1878	L G Spencer	St Johnsbury, VT	E & T Fairbanks	Stirrups for steely'd rod, platform sc
203,589	May 14, 1878	J P Chatillon	New York, NY	John Chatillon & Sons	Counter platform sc
203,719	May 14, 1878	S A Field	Philadelphia, PA		CCD
203,902	May 21, 1878	F Fairbanks	St Johnsbury, VT		Turn-over beam postal sc
204,177	May 28, 1878	J Weeks	Buffalo, NY		2 poise, 2 graduation steelyard
204,869	Jun11, 1878	H Willard	Vergennes, VT	self & F W Coe	Multi-pan postal steelyard
205,354	June 25, 1878	H S Cochran	Philadelphia, PA		Equal-arm & spr'g scales for bullion
205,492	Jul 2, 1878	E Lueders	West Hoboken, NJ		CCD
205,559	Jul 2, 1878	R Kirkpatrick	Debec, Canada		Raising ratchet
205,575	Jul 2, 1878	C C Redmond	San José, CA	self & W H Henderson	Pen postal steelyard
205,623	Jul 2, 1878	T Fairbanks	St Johnsbury, VT		Bearings under platform
205,684	Jul 2, 1878	B F Rogers	Lathrop, MI		Physicians' pocket sc
205,850	Jul 9, 1878	C A Fredericks	Brooklyn, NY		1/2 roberval & spring counter sc
206,659	Aug 6, 1878	W E Brigham	Boston, MA		Ice tongs & spring bal
207,204	Aug 20, 1878	C B Payson	Boston, MA	self & W E Brigham	Ice tongs & spring bal
207,263	Aug 20, 1878	T Fairbanks	St Johnsbury, VT		Druggists dispensing steelyard
207,735	Sep 3, 1878	H L Grisell	Pennville, IA	self & L Grisell	Revolving sleeve on steelyard, pricing
207,762	Sep 3, 1878	J F Milligan	St Louis, MI	self & G S Foster	Bearings under platform
208,444	Sep 24, 1878	T H Ward	Smethwick, England		Crane weigher
209,099	Oct 15, 1878	J H Wright	Des Moines, IA		Compound lever steelyard bracket
209,145	Oct 22, 1878	E Street	South Orange, NJ		CCD
209,180	Oct 22, 1878	T C Miles	New York, NY		Pen & spring postal bal
209,434	Oct 29, 1878	C R Tuttle	New Brighton, PA		Slotted poises redesigned
210,493	Dec 3, 1878	L E Brown	Cincinnati, OH		Household spring scale
212,092	Feb 11, 1879	P M Cummings	Lyons, IA		Poise-lifting platform sc!!
212,300	Feb 18, 1879	G L C Coulon	Paris, France		1/2 beranger & steelyard pricing counter sc
212,559	Feb 25, 1879	C F Kleinsteuber	Milwaukee, WI		Pendulum counter sc, moving load
212,786	Mar 4, 1879	J Birks	Ogdensburg, NY	G Birks of Canada	Weighing spring scoop
213,062	Mar 11, 1879	F D Payn	Albany, NY		Indicator bubble in tube, platform sc
213,332	Mar 18, 1879	A A Houghton	Buffalo, NY	Buffalo Scale Co	Ease of making & testing grain sc beam
213,423	Mar 18, 1879	A A Houghton	Buffalo, NY	Buffalo Scale Co	Poise on multi-beam easy to read
213,898	Apr 1, 1879	D Hallock	Coxsackie, NY		Poise-lifting 1/2 roberval & steelyard counter sc
214,643	Apr 22, 1879	C Forschner	New York, NY		Secure pan hanger
215,607	May 20, 1879	C A Holcombe	Little Sioux, IA		Hydrostatic platform sc
215,477	May 20, 1879	J S Phillips	San Francisco, CA		Pocket assay steelyard
215,607	May 20, 1879	H H Ham	Portsmouth, NH		Calculating drum on counter steelyard
216,514	Jun 17, 1879	J R Linen	Buffalo, NY		2 poises on steelyard
216,184	Jun 3, 1879	G Hoag	New York, NY		Postal steelyard & CCD

NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
216,450	Jun 10, 1879	C Pfanne	Washington, DC	self & H Stiebeling	Beer weigher
216,514	Jun 17, 1879	W C Farnum	Hoosick Falls, NY		Counter steelyard
217,553	Jul 15, 1879	C H Schmincke	Baltimore, MD		Hopper with trapdoor for grain roberval
217,657	Jul 15, 1879	L N Watts	Indianopolis, IA		Roberval & dial beer sc
218,817	Aug 26, 1879	AA Houghton	Buffalo, NY		Pan & hanger detachable
219,902	Sep 23, 1879	J W Blackhart	Wells Tannery, PA		Spring hay fork
220,405	Oct 7, 1879	F Meyer Jr	Newark, NJ		Bearings under platform
220,975	Oct 28, 1879	R L Hassell	Chicago, IL		Dialling poises
221,149	Nov 4, 1879	C H Bidwell & J R Linen	Buffalo, NY		Captive poises for steelyard
221,757	Nov 18, 1879	H M Weaver	Mansfield, OH		Pendulum postal sc
221,826	Nov18, 1879	C Jensen	Dedham, MA		Dial pricing counter sc
222,341	Dec 2, 1879	L G Wooley	Mendon, MN		Bracket & bearings of compound steel'd
223,217	Jan 6, 1880	J Conway	Nether Providence, PA		Pointer on equal-arm beam for yarns
223,296	Jan 6, 1880	G L Richardson	Brunswick, ME		Steelyard hay fork
223,787	Jan 20, 1880	H Willard	Vergennes, VT	self & F Coe	Postal steelyard with two pans
223,999	Feb 3, 1880	C G Cross	Chicago IL	L Sass	Beer weigher
224,038	Feb 3, 1880	G A Phifer	New Richmond, OH		Poise-lifting steelyard family sc
224,494	Feb 10, 1880	J H Usher	Buffalo, NY		Compound steelyard with sloping beam
224,807	Feb 24, 1880	J A Thompson	Chicago, IL		CCD
224,972	Feb 24, 1880	J T Tillman	Spartanburg, SC		2 poises on steelyard
225,008	Mar 2, 1880	J Goodale	Cambridge, MS	E B Welch	Counter pendulum sc, dial face
225,513	Mar 16, 1880	P Evens Jr	Covington, KY		Even divisions for pendulum scale
226,000	Mar30, 1880	W W Reynolds	Rutland, VT	Howe Scale Co	Army rations portable scale
226,046	Mar 30, 1880	R F Dobson	Darlington, WI	self & J Wharrie	½ roberval & pendulum
226,083	Mar 30, 1880	W B Le Noir & R P Chunn	Lower Peach Tree, AL	W B Le Noir	Guillotine attached to platform sc
226,959	Apr 27, 1880	W C Barr & W H Axford	Jersey City, NJ		Spring bal on elevated rail
227,050	Apr 27, 1880	G S Palmer	Waterville, ME		Dentists' amalgam unequal arm sc
227,579	May 11, 1880	W W Reynolds	Rutland, VT	Howe Scale Co	Storage of poises, counter steelyard
227,645	May 18, 1880	CC & SB Parker	Brooklyn, NY		Protective loop round spring bal
227,849	May 18, 1880	J Smalley	Boundbrook, NJ		Graphite & shellac bearings
227,969	May 25, 1880	F Fairbanks	St Johnsbury, VT	E & T Fairbanks	Platform for filling barrels
228,843	Jun 15, 1880	D Vincent & D Johnen	Paris, France		Counting scale
229,663	Jul 6, 1880	C H Bidwell	Buffalo, NY	Buffalo Sc Co	Adjustable poise with 2 added poises
229,962	Jul 13, 1880	B G Corser	St Johnsbury, VT	self & L C Shear	Rule & postal steelyard
230,592	Jul 27, 1880	J B Williamson	Louisville, KY		advertising tape measure & letter sc
231,516	Aug 24, 1880	C E Allen	Mansfield, PA		Calculating steelyard
231,989	Sep 7, 1880	G W Bliss	Mansfield, OH	W T Bliss & E B C Ford	Calculating grain sc
232,245	Sep 14, 1880	J Deschamps	Paris, France		hydrostatic scale
232,393	Oct 21, 1880	D W Dake	Beloit, WI		Sleeve with different weight systems
234,656	Nov 23, 1880	E A Chameroy	Paris, France		Printing ticket steelyardbeam
235,663	Dec 21, 1880	J B Atwater	Geneva, IL		Bilateral shop pendulum scale
235,723	Dec 21, 1880	W S Auchincloss	Philadelphia, PA		Counter steelyard to find averages
235,982	Dec 28, 1880	C F Batt	Phoenixville, PA		Trade bilateral pendulum scale

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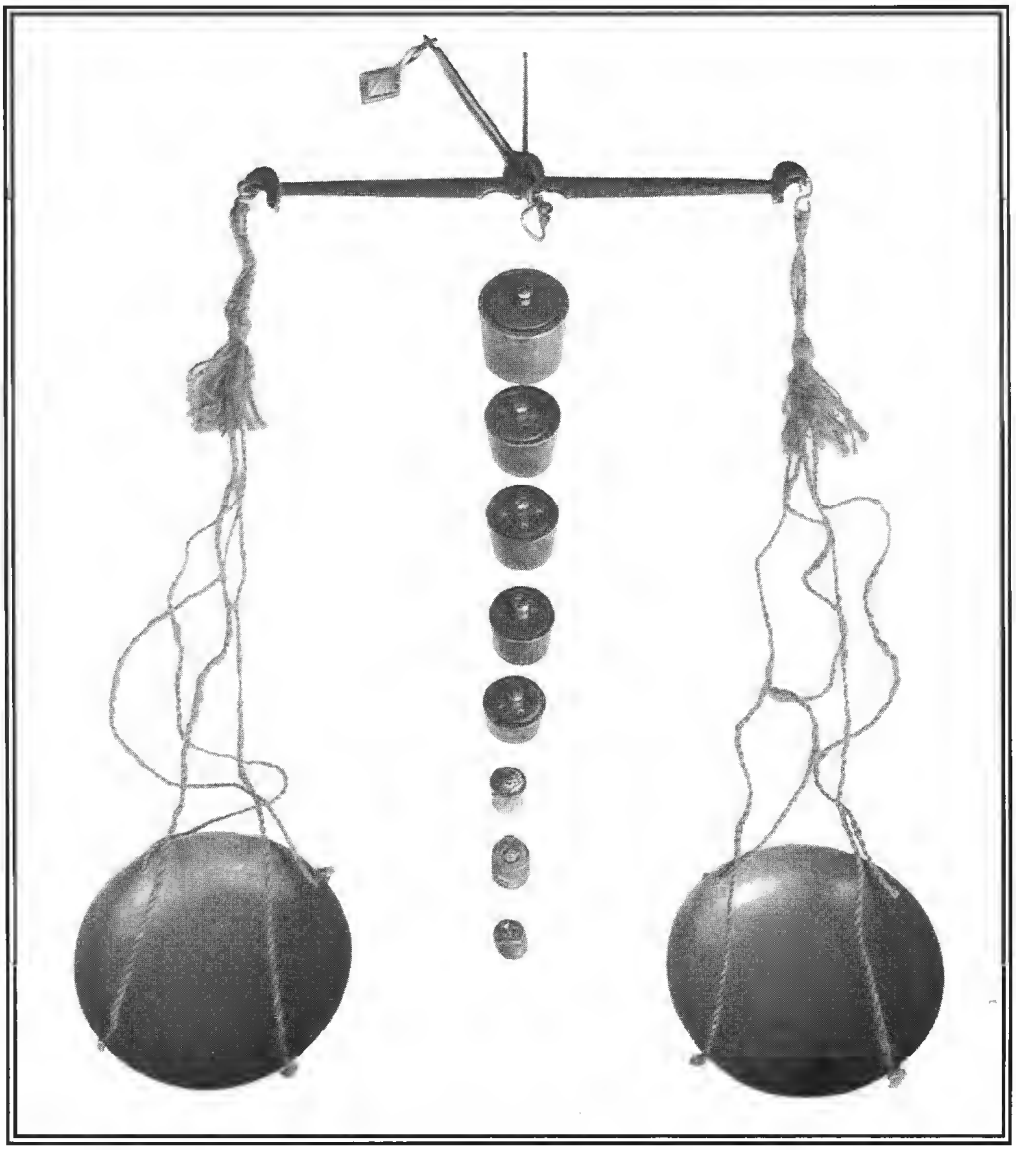

Cover Picture

This appealing little scale, only 4 ¾ in long, is made of iron, as is typical of the small, boxed scales made in Iran (Persia) during the 19th Century. It has boxed swan neck ends. The brass pans are deeply cupped for weighing gems. They have been re-threaded in bright orange string with a red accent thread. Like many another ISASC traveler, William James succeeded in convincing the gem dealer to sell him his scale rather than the lapis lazuli that was his stock in trade. The eight weights, five original and three home-made replacements, correspond to the old Persian system based on the derham of 1gm and range from one to eight derhams. The box was originally plain and probably hand-carved locally. In 1972, while participating in an overseas study program, he had the opportunity to observe the local technology in Kabul.. "There were blacksmiths in the country," he writes, "as I had a shovel and nail made by one. Then I went to a woodworker to have a handle made, and then assemble the shovel. The process took all day. No Ace Hardware store! The iron is probably recycled from any iron/metal scraps. The Afghans were the first recyclers, and they recycle everything. The bottle in which Coca Cola came was more precious than the soft drink." He shares his adventure on page 2795.

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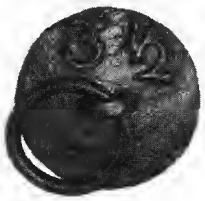

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Contents

EQUILIBRIUM's 25th Anniversary

In the Spring, 1978, inaugural issue of "EQM" Founding Editor Michael Crawforth wrote, "I have tried to indicate the range of articles, both in size and content, which I believe will make our magazine interesting and useful as a permanent refererence. The format is one to which all members can and, I hope, will contribute, both voluntarily and by invitation. Every contribution will be duly credited with authorship . . . We have been forging friendships and exchanging data for more than a year now, and the time has come to pass on more formally the immense amount of information held by our members, and to show the skeptics that collecting is not just possessiveness but also involves intellectual enquiry and the pursuit of historical verity." Under the Editorial guidance of Diana Crawforth-Hitchins for the past 14 years Equilibrium has continued to provide a forum for the sharing of knowledge about scales, weights, and weighing that is without parallel in world publications. From that beginning, Equilibrium has grown into a globally circulated magazine. We honor and thank both Michael and Diana for their outstanding editorial leadership.

As your new Editors, we pledge to carry on this illustrious tradition Insofar as possible, we will provide a balanced reading diet, addressing the interests of our heterogenous, worldwide readership. Please send us your contributions (articles, pictures, ideas), as well as questions and requests.

Ruth Hendricks Willard Editor *Jan H. Berning Associate* Editor

Rare Oertling Bullion Balance

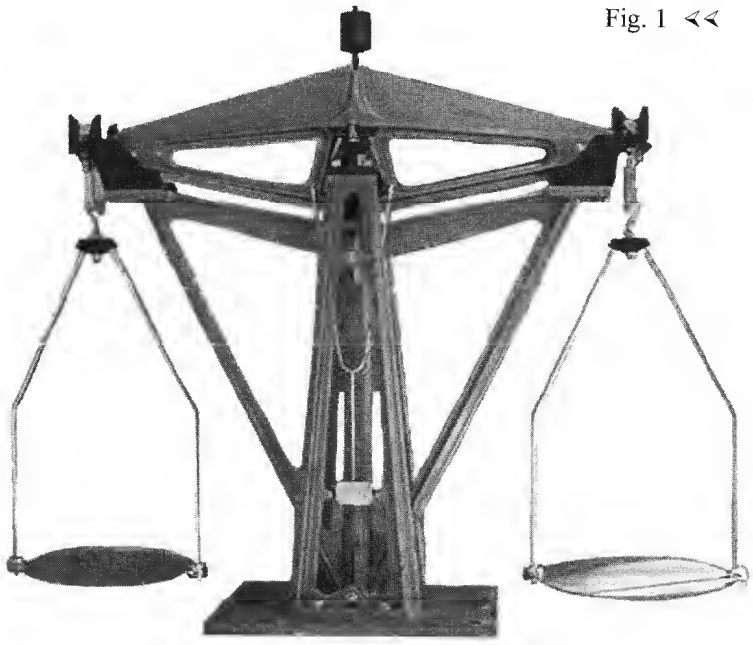
BY B J OLIVER

For thc last ten years my colleague, Peta Buchanan, and I have been researching the history of Oertling, the well-known precision-balance company, and in the course of this work we have uncovered some 30 of their bullion balances. Most of these are somewhat elderly, many dating back to the 1860's or even earlier. Several are in Australia, and every one of those seems to be worthy of note, but here I discuss solely the latest one to come to our attention.

Late in 2001, ISASC Europe received a call for help from a scale technician, Ian Nowicz, of Adelaide, Australia. Could we identify and value a huge Oertling bullion balance that he had acquired for himself during the course of his travels? He had rescued it from a gold and silver smelting works. It has a massive 48-inch beam, and everything else is suitably massive to match. He has succeeded in mounting this monster upon a specially-constructed steel stand, the original wooden table being now missing. The bridge piece has the rated capacity of 2000oz. Troy (60kg.) engraved on the front, and a 6-digit serial number on the rear. The beam is finished in a grey hammertone paint, and is beautifully engraved with the company name. The rest of the balance is mostly grey, with some parts in maroon enamel, and others, such as the pans and pointer, chrome plated. The heavier parts of the underworks have lettering cast in, notably 'A48.x' and 'DE G.S.'

At this early stage we had no photographs, only thc above description. Further, at that date we had no understanding of the serial numbering of the bullion balances, unlike the numbering of their laboratory balances, which we understand well and can date exactly. No Oertling bullion balances are grey and maroon - at least, we hadn't seen any! Frankly, we were baffled.

Fig. 1 <<



Then the photographs arrived, beautifully crisp and well-composed shots which made everything clear. Consider Fig. 1, a general view. At once we saw that this was basically the routine 48-inch Model A, whose origins go way back to about 1850. See the catalogue engraving of 1885, Fig. 2, noting the similarity of the beam, tower and inverted delta-frame. But all those old ones were in black enamel with brass fittings, not grey with maroon and chrome as we have hcrc. The rest of the balance has a much more modern look about it: Chrome-plating suggests post-WWII, and the gravity bob, the pan hangers, the sus-

pension pieces and the horn pieces all look 1960-ish. Could it perhaps be an old 19th-century one that has gone back for a factory overhaul and been thoroughly updated? Why not, for all the 'new' pieces are of the smaller, easily replaceable parts? Is the serial number compatible with this idea? Let's face it, we were stuck again!

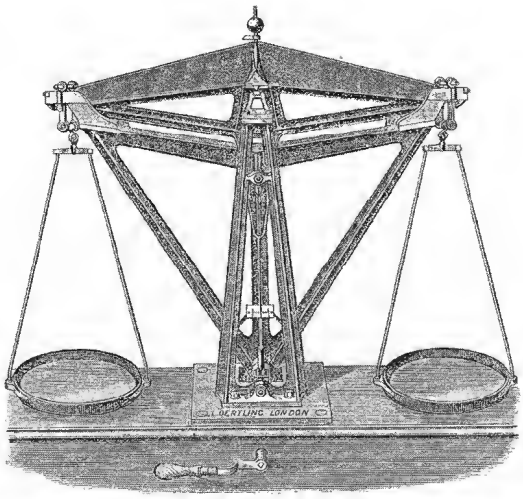


Fig. 2 ⅄⅄ Oertling catalogues of 1885 and 1891. This was his largest, most rugged bullion balance, made to carry up to 2,000oz in each pan yet still show the franctional part of a grain with certainty.

What this balance had shown so far was the extent of our ignorance, in mid-2002, of Oertling bullion balances, which we had rather ignored whilst pushing ahead on the more numerous and more easily-studied chemical and assay balances. Careful reconsideration of the bullion serial numbers combined with extensive discussions with retired Oertling engineers has, in the last few weeks, elicited enough information for us to be able to claim a superficial understanding of the Oertling bullion balance range at last.

Now we can answer the original query. We believe we can date this balance to a fairly tight time-window, 1958-1963. It is exactly as built, except perhaps for the loss of its table, although we now know that some were exported minus table, to be fitted up into a locally-made table or case at the destination. It is a 48-inch Model A, in the specially revised version that was made briefly, and only to order, from 1958 to about 1967. The object was to make this aged 19th-century design look more modern without incurring lengthy development costs for a new model. Its brief production run is, of course, the reason why we've never seen one before. Also, few new bullion balances were needed in the late 20th century, mainly because the old ones lasted so well, and could easily be revived with an occasional regrinding of the knives and a repolishing of the planes. However, in about 1965 the company realized that they simply could not push this century-old design any longer in the market place, and they began work on a set of bullion balances of a radically new design in three different sizes. These did not last long either, as the opposition went into electronic bullion scales, and Oertling abandoned the field by about 1985. Let us return to Mr. Nowicz's balance.

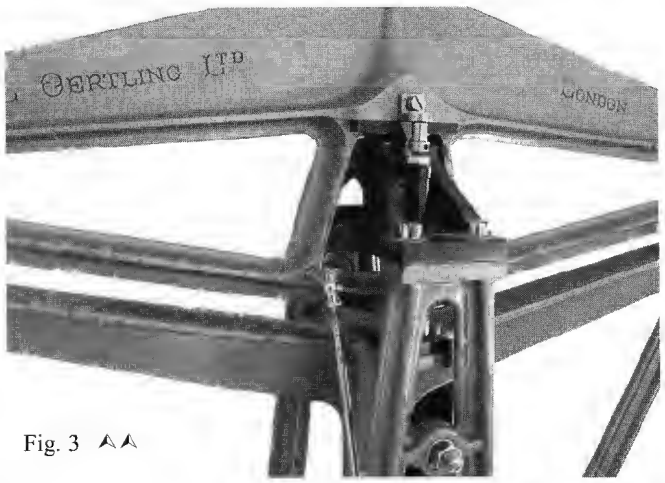


Fig. 3 ⅄⅄

The sand-cast beam is in the traditional bronze, and nicely engraved with the company's name in its distinctive font, see Fig. 3. The engraving was done on a pantograph-type engraving machine from a brass template. The beam is 'captive,' that is, the bridge carrying the centre-plane passes right through the centre-light (opening), such that the beam cannot be removed without taking the entire bridge out first.

The centre-knife and plane are shown very clearly in Fig. 4. Each is made of hardened steel, the 60kg maximum load being considered excessive for agate or corundum. The end-knives and planes are also of steel. All this is 19th-century technology, but the small vertical structure in front of the centre-bearing is a 20th-century addition; see Figs. 3 & 4. It is one of three locating pins, the others being behind the beam, near the end knives, and not shown in these pictures. This three-point or kinematic arrestment (1) ensured a much more precise placement of the centre-knife on its plane, enhancing reproducibility.

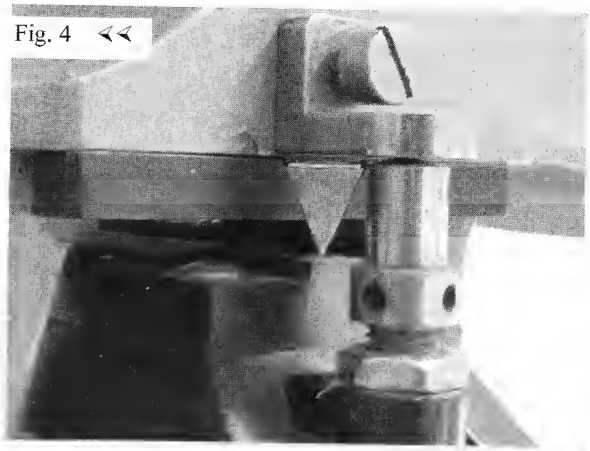


Fig. 4 ≺≺

The cast-iron lattice tower supports the bridge piece, and provides guidance for the vertical movement of the cast-iron inverted delta frame. This massive frame supports the horn-pieces; the left one is shown in Fig. 5. These are of finely-machined brass finished in maroon enamel. They lift the end-planes on the suspension-pieces clear of the end-knives on the beam when the balance is arrested. The chrome-plated suspension-piece in Fig. 5 engages the hook on the huge panbow. The chromed parts are mostly brass, not steel, because of the possibility of steel parts interacting magnetically with the cast-iron frames and baseplate.

Fig. 6 shows a close up of the underworks, comprising a shaft with a simple cam contacting a lever to raise and lower the delta frame. The handle rotates 180°. Upon release, as the frame begins its descent, so the end-planes in the loaded suspension-pieces engage the end-knives, then the entire loaded beam is placed by the kinematic arrestment (attached to the descending frame) upon the centre-bearing.

Unusually for a Model A, this balance has an off-centre release-shaft. Two possible suggestions have been made: either it was to avoid a middle leg on a specially-made table, or to avoid interference with mechanical handling equipment loading bullion on and off the right hand pan. As to the lettering cast into the underworks: 'A48' is now obvious, with 'x' being the part number; 'DE G.S.' is De Grave Short, the well-known scale company that was, like Oertling, an Avery subsidiary. Both companies occupied the same premises, and had done so since 1928, so they were by now running effectively as a single unit. For administrative convenience, most ordering was done through De Grave, including all wooden patterns and castings therefrom. A nice traditional touch, even as late as the 1960s, is


Fig. 5 ≻≻

the wooden release handle. These were made in-house by the cabinet shop, using a small piece of fine tropical hardwood specially selected to display a bold and showy wood grain. See Fig. 6.

Finally, what of the monetary value of this piece? Not great, because of the very low demand and the relatively high supply. Many traditional bullion balances are now sold for scrap after being replaced by electronic scales. Very few are taken up by either museums or collectors, and for exactly the same reason: lack of space. Australian and American homes are probably larger than European ones in general, but few housewives are going to welcome a monster such as this into the living room, and few collectors have a collection room. Where bullion balances do find a home, it is the gleaming brass and mahogany ones, not hammertone and chrome. How satisfying it is to find that at least one of the latter type has indeed been preserved by an enthusiast.

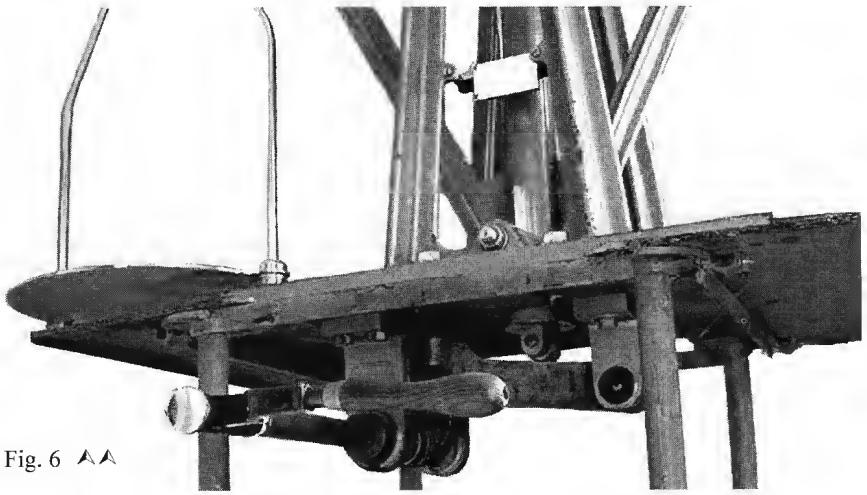


Fig. 6 AA

Acknowledgements

My grateful thanks to the many retired Oertling engineers who have patiently answered all my questions on this and other topics, but especially to Dick Wood, ex-Managing Director, and Frank Chappell, ex-Technical Manager. My thanks also to Peta Buchanan for helpful critical comments on the draft of this paper.

Notes and References

1.. Oxford English Dictionary: Kinematics is defined as Applied to a set of mechanical elements so disposed in relation to each other that the relative position and motion of each is uniquely determined by the relative position and motion of the other(s). In layman's language, this means that, if the beam has slipped sideways slightly, due to rough handling during release, this mechanism (the cones and pivots) forces the beam back to its intended rest position when re-arrested.

2. The author would be pleased to hear from fellow ISASC members world-wide about any Oertling bullion balances which they know or possess, with beam length, capacity, serial number and a photograph.

3. Apart from Oertling catalogues, especially 1885, 1891 and 1909, I find I have no references to quote: this just reflects how very under-researched is this area of metrology!

A Prize Assay Balance

BY G B WILSON

I saw and was immediately attracted to this scale. At the time I was browsing in a small gem shop associated with a gem mining operation in Pala, California, a quite small town among the Indian reservations in northern San Diego County. The scale, a beautiful portable assay balance, was displayed in a case of gems and mine products.

I had become addicted to scale collecting while working in Sri Lanka (formerly Ceylon) and upon returning to the U.S. found myself increasingly drawn to 'fine end' weighing devices, and this little beauty fit that category.

At this point in my collecting experience, having acquired and examined in detail a few scientific balances, I could see this was of that nature and finer than I was accustomed to seeing. Trying to conceal my eagerness I "casually" inquired as to its availability. The lady running the shop was friendly but advised me that she could not accept an offer for the scale as it belonged to a German firm that owned the gem mine. I learned that she and her husband were lessees. That was the start of what became an intermittent pursuit for twelve or thirteen years!

Looking back. I wonder at my tenacity. While to me it was a beautiful specimen, one would expect my acquisitive desire to cool with time. Indeed, at times I did forget about it but then, some scale adventure would remind me of it and I would return to the pursuit.

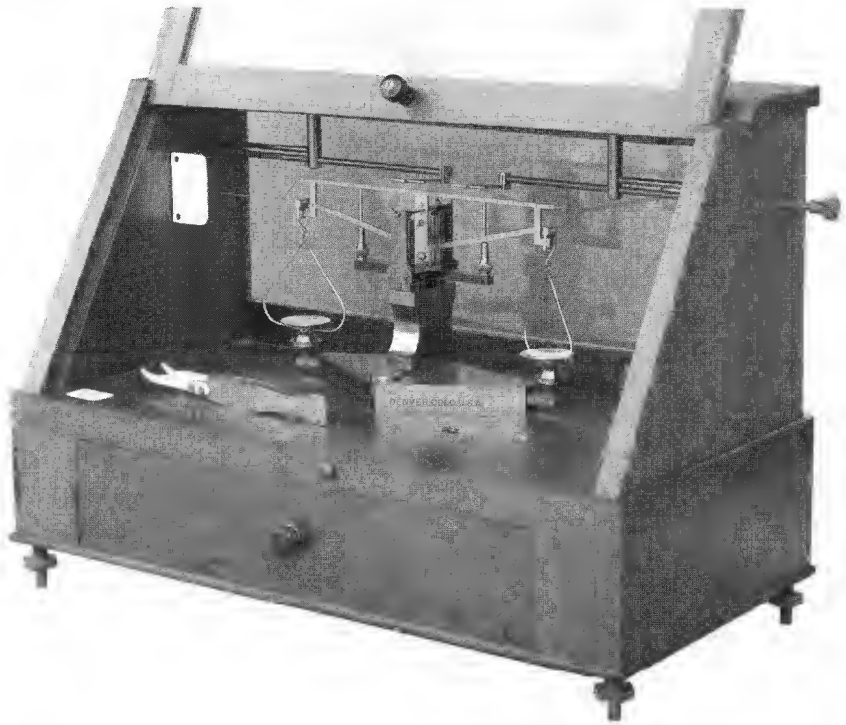


Fig. 1 Full view, William Ainsworth & Sons Portable Assay Balance, circa 1916. Readily weighs to 0.0001mg.

First, I sought, through the operater, to reach the mine owner and found the operater didn't have the owner's address! It seemed they sent their rent to an American accounting firm who represented the owner's interests here.

Given an address for this firm, I turned to them for the owner's address. Properly protective of their client, they demurred, asking what my business was. My explanation obviously did not impress them, as they would not give me an address. I abandoned the pursuit.

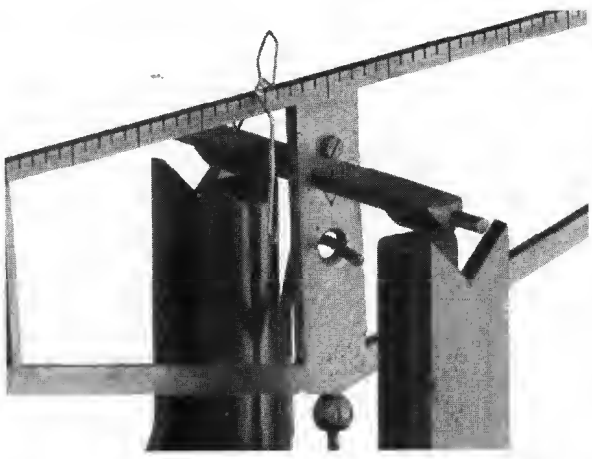


Fig. 2

The 10mg rider is placed 5 calibration marks off-center out of a possible 50. If placed on the center, it would lend no weight to either pan. As shown, it places 5/50ths of 10mg (0.0001gm) on the left pan. Ainsworth made a 1mg rider (I have one!) and even a fimg rider. One mark on the beam with a fimg rider equals 0.00001gm. Amazing! A close look at this photo helps one to visualize the minute agate pivot points and bearings in the shadow that make such increments feasible.

Upon next inspiration, I tried to get the accounting firm to forward a letter to the owner for me. At this point they began to get evasive and, in my judgment, overprotective. They would not forward my letter saying the miner occasionally used the scale, a statement that was manifestly false. Again I gave up the fight!

Years went by and I acquired and repaired an Ainsworth Assay Balance with the help of John Shannon. At that point my memory was again triggered but I did nothing. John and Gerry Shannon's great book on assay balances was another trigger but still I didn't go back.

Early this year, again reminded, I decided to try once more. Over time I had learned the miner now owned the mine… perhaps the scale? Also, affecting my decision, I knew a new Indian Casino had been built in the little town of Pala, and conceived that the mine might no longer even be operating.

Back to the quest!

Luck was with me, and I found the mine still operating, and the scale still on display, though in a changing environment. Wiser in my approach now, I made an appointment and met the miner himself, now the owner of "my" scale.

Meeting and getting acquainted with Blue Sheppard, the miner, was an experience all in itself. As the purpose of the writing is to tell you about this scale, I will refrain from attempting to tell you all about Blue. Suffice to say whatever your stereotype of a miner may be, it doesn't fit him. His is an eager, alert mind brimming with ideas and, while still in his fifties, he has world wide experience in gem mining, gems and gemology. In the process of persuading him to sell me a scale I have made a friend. Would you believe it, he's a scale collector and is joining ISASC. He can't be all bad! I think that part of his reasoning in selling this scale to me was that his scale was going to a good home!

Yes, about the scale. Many of you are "fine end" enthusiasts but many have devoted their energies to other facets of our intriguing hobby. It is to the latter group, who may not have been through these thoughts, that I direct my remarks. We all know that accuracy in weighing is relative. On a 200 ton- scale in a batch plant for concrete, plus or minus 400 pounds may be considered accurate. Scientific balances of the thirties having 100 gram capacity were commonly calibrated to 1/100th of a gram with finer readings by means of riders, chains and verniers to perhaps 1/40th of a milligram. By comparison, this assay balance, with a capacity of a mere two grams, may by means of riders, achieve an accuracy of 1/200th of a milligram!

Why such accuracy? Consider the assayer's problem: His is the job of providing the miner with a reasonable estimate of the amount of precious mineral, let's say gold, in an ore sample that the miner thinks is representative of his mine. If the assayer makes an error of 1/100th of a gram in the very small sample he tests and gold is worth $300.00 per troy ounce, his error would represent around $2800.00 per ton of ore! The need for accurate weighing is obvious. So also is the need for a good representative sample and precise refining of the sample by the assayer, all of which is beyond the scope of this scale report.

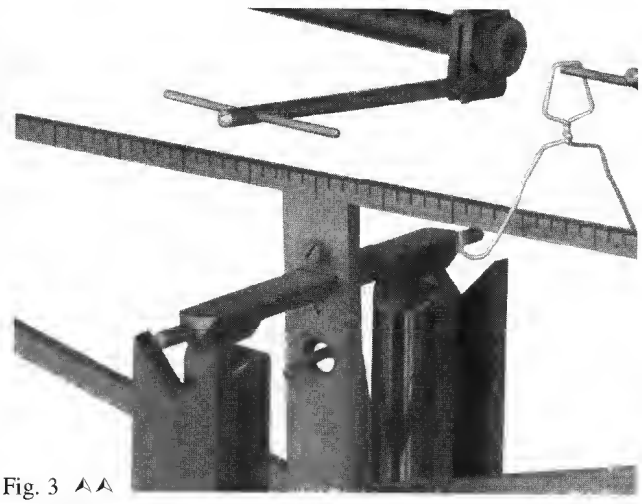


Fig. 3 AA

One may readily understand the beam rider weights from this photo. On each side of center on this beam there are fifty calibration marks between beam center and a point directly over the weight pan pivot. When over the center, a rider adds no weight to either pan. A 10 mg rider weight is shown placed five calibration marks off center toward the left pan. So placed, it adds 5/50ths of 10 milligrams, or 0.0001 mg to the left pan. Using a ½ milligram rider as supplied by Ainsworth, the space of a single calibration mark on the beam represents 0.00001 mg!

The Portability of this beam while in place is provided by the wire "hook" through the beam seen in the center of this view. When the "v" blocks shown are raised to lift the agate knife edges from their tiny agate seats, a little further turn on that control, while depressing the Portablility lock button, moves this hook down, locking the beam in this safe, elevated position.

How does a mechanical scale develop such accuracy? Let us consider just one of the major enemies of the scale maker, ordinary friction, in this case in the scales bearings and pivots. Most of us have become familiar with the development of these critical points in scale manufacturing. Over centuries pivots have progressed from string to knife-edges resting on a polished plate. In the heyday of mechanical scales, materials used for pivots and supports drew a great deal of attention from designers. More recently pivots and supports in more accurate scales are gemstone, often agate because of its ready availability and characteristics. The "V" slot supporting the knife-edge has given way to a polished agate plate for the central pivot in sensitive equal arm balances. One would consider that a polished knife edge resting on a polished agate plate would reduce friction to near negligible. Not so!, say the ingenious souls who continually seek to improve these instruments.

Upon disassembling for cleaning inspection, I found this Ainsworth Assay Balance has gone significantly further. No wonder its capacity is limited to two grams! The traditional central polished agate knife- edge is supported on two tiny agate rods, transverse to the knife-edge and each maybe 1/16th inch wide. The rods appear to be rectangular in cross section though the bearing surface may even be crowned slightly, thus reducing bearing to a pair of virtual points!The manufacturer's claim of sensibility to 0.00001/grams begins to sound more reasonable.

To satisfy my own interest I must now learn more about the assayer's refining process, obtaining and preparing a representative sample, obviously as critical as the scale used in the process. Can you help me?

How Afghanistan Forged A Scale Collector

BY WILLIAM S JAMES

The interior of the largest covered market in Afganistan. Fig.1 I

In the spring of 1972, I was studying in Afghanistan as part of an overseas study program of Lewis and Clark College in Portland, Oregon. Afghanistan has long been the focal point of many conflicts between super powers. Due to its unique geographic location, it has been the "Crossroads of Asia," where invading forces traveled through this land to and from the Indian subcontinent. Prior to the recent events dealing with terrorism, this country has been caught between the ancient empires located in the Indian subcontinent and the Middle East, Tsarist Russia and the British Empire, and the Soviet Union and the United States. When we were there, Afghanistan was a monarchy that loved to play one super power against another. I remember one government official joking about this as he lit his US-made Camel cigarette with matches made in the USSR.

The country is very rugged,with the Hindu Kush Mountains running through the center. Afghanistan is a land of extremes, with 20,000 foot mountains and low lying desserts. Parts of the country are covered with forests, while others are devoid of trees. It could be below freezing in one area and over 100 degrees in another. There are lush green grasslands while not too far away, barren, rocky soil barely supports life. Water is plentiful in some parts of the country and scarce in other parts. To compensate for this, the Afghans built laarge underground irrigation tunnels to move water fro one area to another.These ancient tunnels had been expanded and were still in use thirty years ago.

Fig 2 The gem dealer who reluctantly sold me his scale

In 1972, the Afghan people were very hospitable and tolerant. When they invited you into their home, you became part of their family. They overwhelmed you with food, tea, and conversation. Since you were a guest of theirs, honor stated that they would defend and protect you with their lives. They were a joyful society, where children in vibrant colors played in the streets and laughed. They were also a very modest society, where many women tended to stay within the family compound and were hesitant to meet with strangers. When women left the home, they wore a dark colored chadri or full body veil to protect themselves from aggresive, uncouth men. But when the women arrived at their des-

tination they took off the chadri to reveal the latest in Western fashion. Afghans welcomed many religious groups to their society. The population was a mixture of Jews, Christians, Hindus, and Sikhs, along with the Muslim majority..

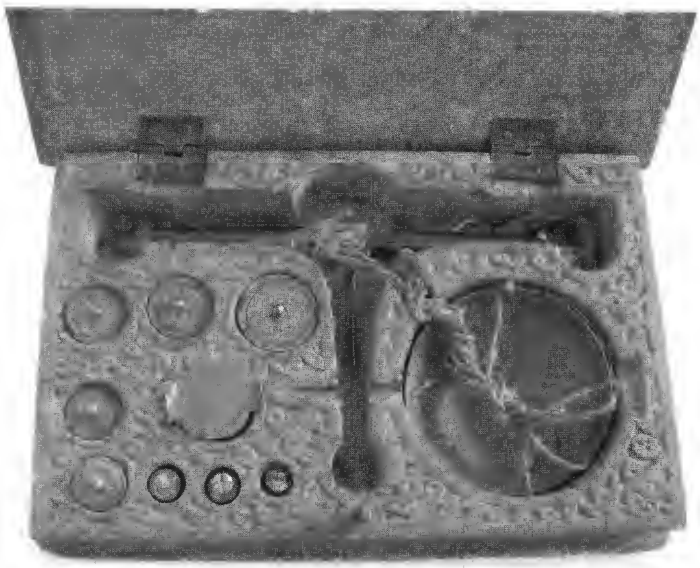


Fig 3

While studying there, I lived with a seven person Afghan family. Their house was located about five miles from thc center of the capitol city of Kabul close to the Soviet Embassy.. My family was the poorest of the students' host families. The house was constructed of adobe brick covered with stucco or plaster. It had four rooms and a water/wash room. The kitchen and outhouse was outside across the walled courtyard. The floor was pounded soil covered wth Afghan carpets. In the beginning, I slept on the living room floor until a bed was made for me. Compared to the neighbors, my host family was well off, as we had a water well, but no running water.

The host father, a graduate of Columbia University, administered the entrance exam for Kabul University. He spoke excellent English and was a task master about having me learn the local language. I could speak only English when I was teaching his four children; otherwise I spoke Farsi. The mother was a great cook. I never realized there were so many ways to cook mutton, goat, and rice. She was also a wonderful nurse, who tended to me when I was sick due to the country's poor sanitation. The two boys and two girls ranged in age from eight to eighteen years. The concept of age was foreign to them, as they did not celebrate birthdays or concern themselves with this..The grandmother was a surprise to me. Even though I lived with the family for over five months, it was not until the end of my stay that I actually saw her. She alway stayed in one room and would only move about when I had the living room door closed.

Each day after walking past fields and small shops, I would take a bus into town for my classes. These consisted of area studies and culture, Afghan history, Farsi language, and an independent project—in my case, the flora and fauna of Northern Afghanistan. Local English speaking college professors and the Peace Corps served as our instructors. Classes were held four days a week from 9:00 a.m. to 4:00 p.m.. At other times we

Fig 4

were with our host families, traveling, meeting with people in the bazaars, and doing whatever college kids do The 24 students from my college had a floor in a local hotel as a dorm, but many of us chose to stay with our host families. After all we had a living allowance of $2.00 a day and in Afghanistan you could live like a king.

During my stay in Afghanistan I was impressed with the many historical artifacts and monuments that were located throughut the country. Roads that were straight as an arrow took sharp turns to miss ancient edifices. Farmers plowed around thousand-year-old ruins, I remember sitting on the head of an ancient 175-foot-tall Buddhist statue in Barnian and admiring the frescsoes above me that the monks had painted more than 1,000 years ago.Today, those statues hae been turned into rubble after being destroyed by the Taliban government.

Fig 5 ⅄⅄ The pendant is made of silver with a Persian motif.

As part of our study program we toured this Texas-sized country. On one such tour, our bus stopped at the bazaar in the city of Pol-e Khomri for lunch. Pol-e Khomri is situated half-way between Kabul and Marar-e Sharif, and the town was noted for the largest covered market place in Afghanistan.

After lunch I went for a walk through this football-field-sized market place. It was dark and smokey. Every stall had a samovar for tea and the samovars were heated by charcoal, which puts out much smoke. People were smoking; some stalls were lighted by candles, and blacksmiths were at work. All the urban areas had a brown haze or smog over them from the fires for cooking, heating, etc. Charcoal and dried animal dung were the primary heat sources. Mulberry, fruit, and nut trees were also used for fuel after the trees had outlived their usefulness.

⅄⅄ Fig 6 The clasp is made from iron probably recycled from scrap.

I remember seeing a white haired man in a flowing turban and wearing the native dress of Northern Afghanistan weighing deep blue stones in his market stall. He beckoned me to come closer, as he thought he might have a buyer for his lapis lazuli. Instead, I asked him if I could take a look at his scale.

It was his scale case that caught my eye. The case measured 7 inches wide, 4½ inches deep, and 1¼ inches high. The cut-from-solid case had been elaborately carved inside and outside in a Persian design. The lock had been made of metal and looked as if it was the Islamic crescent. The scale, which fitted inside, was an equal arm beam with boxed swan-neck ends. The scale beam (4¾ in long) was made of iron, but the finger hold was made of silver. with a Persian motif.

The pans were deep and made of brass. Someone had spent time re-stringing them to the beam in a bright orange string with a red accent thread. Five original weights and three homemade replacement weights were in separate holders. Under a brass door, dried chick peas were stored to serve as the minor weights.

I started to bargain with the shopkeeper to determine the price of the scale. He placed a great value on it, and did not want to part with it. It would cost him a great deal of money to replace it and the scale was a major tool in his business. Finally a classmate came to me and said that everyone was waiting for me on the bus, "so give him what he is asking and let's go!" I reached into my pocket and produced either 1000 or 2000 Afghanis, the equivalent of $13.00 or $26.00. At the time it was a lot of money, but now the scale and its lovely case were mine.

In 1972, Afghanistan was very concerned about the export of historical and archaeological treasures. When I sent this scale home to the Unite States, it needed to be verified by the Kabul Museum that it was not piece of Afghan history. On the bottom of the case, a glued piece of paper with the seal of Afghanistan can be found signifying that it is not of historical value. When the scale arrived in the United States, customs would not allow it into the country until the chick peas were removed, as they might be bringing an agricultural pest into the country.

When I purchased this scale 30 years ago, little did I realize that it would be the first of many scales that I would eventually acquire in this fascinating, addictive hobby of mine.

<< Fig 7 Experimental weighing confirms that the weights are in a series based on the old Persian unit of 1 derham = 1 gram. The 3 homemade weights, which are unmarked, weigh respectively 1, 2, and 3gms. The tops of the 5 original weights are marked with dots agreeing (loosely) with the expected masses of 4, 5, 6, 7, and 8 derhams. According to *Tate's Modern Cambist*, these values were in use at least through 1929.

About the author

After Afghanistan and graduating from college, Bill James went on to Oregon State University for graduate studies. There he met his wife, Nancy. In the beginning, his interest in scales revolved around egg and kitchen scales. This was because he was in the food and agricultural industry, specializing in food safety. Since Bill Doniger introduced him to ISASC a few years ago, his scale interest has expanded to include coin and Asian scales. When he is not scale collecting, he is trout and salmon fishing.

No Stone Unturned

BY JOHN KNIGHTS

At a time when my profession requires me to try and bludgeon an unwilling minority of the UK public into converting to the metric system (when Condorcet declared it to be 'For all people for all time,' he was obviously not speaking for all people in Scunthorpe), I was particularly interested to see recent reference to the erstwhile Butcher's Stone, which staged a rearguard action in the 1930's; rather reminiscent of that now being fought by the Imperial System .

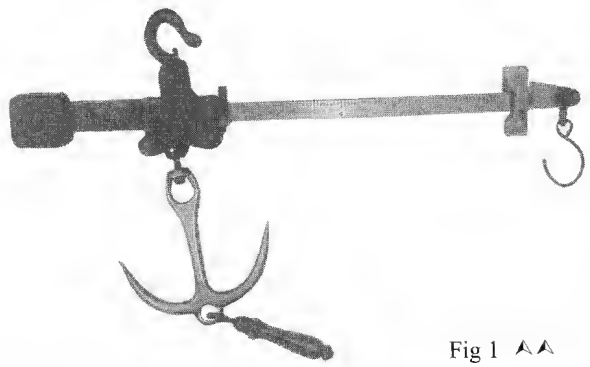


Fig 1

There was a time when; had I been asked what the Butcher's Stone was; I would have said it was a disease prevalent amongst those in the meat business, (along the lines of other trade specific illnesses such as Fiddler's Elbow, Golder's Green, Boxcar Willie, etc).

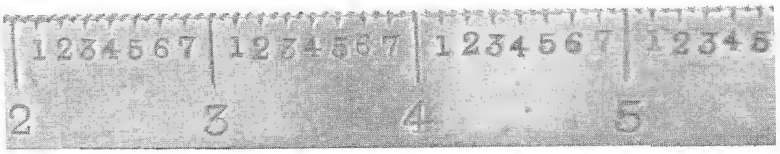
That was until I came across a device graduated in this mythical unit. At a time when I had only just begun to acquire the occasional item of early metrology, I visited a Bank Holiday event at a Lincolnshire farm where displays of steam threshing, horse ploughing, sheep shearing and similar ancient rustic pursuits were being held. The farm also had a museum (or more accurately, a shed) with various agricultural implements from the past, displayed in a casual fashion around the place. Hanging from the ceiling there was, what appeared to be, a standard 300lb steelyard. It was only on closer inspection that it was revealed that the graduations were, in fact, units of 8 lb, thus converting a commonplace artifact into an object; even at that early stage of the collecting habit; of desire.

I considered larceny and eventually dismissed it, largely because of my innate shining sense of honesty and the impracticality of inserting a four foot steelyard down the trousers. (Oh those hooks!!)

Since then, during the course of an eclectic and largely unfocussed collecting activity, I have invariably examined every butcher's steelyard I've encountered. All were, predictably, three hundred pounders.

Collecting is a strange madness; clearly an intellectual pursuit of the higher brain that the lower brain does not really approve of.

Fig 2



After a hard day's collecting therefore; when many hours have been spent trudging round the great outdoors and jostling in the crowded halls, avidly staring at the cumulative detritus of other people's lives; there comes a point when the cerebrum gives up for the day and the lower functions suddenly kick in and ask you what you think you are doing! Suddenly the joy has gone and you gaze at the spoils of your day in some disbelief that you have spent precious hours ofyour life acquiring such stuff. The blackness of your soul is matched only by the yawning void within your wallet and you vow never to walk this way, ever again!

Or is that just me ?

It was at such a time, as an early winter dusk was falling on the great Newark Antique Fest, that we were wending our way wearily towards the exit, past stalls, we had passed a number of times before. This one was clearly no three hundred pounder, as it had ten major divisions, each one of which was divided into eight. By way of explanation the shank was marked "Divisions of 1lb" and "Divisions of 8lb". The poise was not the usual pendulous type but a sliding poise loosely threaded on the notched shank. A nib located the poise at the notches. These were somewhat worn owing to the lack of a protection mechanism on the poise.

There was a stamping plug; although any stamp had long been starred by a vindictive official; and a name "Stillwell and Sons Scale Makers, 214 Old Street, London EC". The machine was marked with a capacity of 400lb which led one to ask where the other 320lb came from. This was apparently provided by a hook on a knife edge at the end of the shank on which, presumably, proportional weights were suspended. There must have been four poises ranging from 80lb to 320lb as the hook could only carry one at a time; but unfortunately all were missing.

Thus at this dark time of the day I was faced with an item that I had sought for years, which was however, incomplete and presented when I really wanted another collectable like a hole in the head.

Fig.3

Reader, I bought that steelyard!

The London Stone

The existence of a stone of 8lb was recorded in the 13th Century when it was used for various commodities including sugar and spices.

By the 18th Century it was also associated with the sale of meat. Its use as a butcher's stone is again referred to in the 19th Century but, by this time it was also said to be a customary unit, in use in London instead of the 14lb stone used elsewhere.

Any use of such a contradictory unit should have been concluded by the Act of 1878, which set out the multiples of the avoirdupois pound, which were permitted for trade use. The stone was unequivocally defined as being 14lb and there was no mention of an eight pound unit at all.

However, practices long beaten into the soul on the anvil of custom and tradition are not readily extracted by the pens of mere lawmakers.
Thus, the use of the butchers' stone, in London, appeared to continue in an unfettered if totally illegal fashion. As the transactions concerned were of a wholesale nature one suspects that the trade in the an achronistic unit carried on largely ignored by the enforcement officers whose major concern would have been with trade at the retail level.

What is more surprising is the fact that equipment calibrated in an unauthorised unit continued to be verified.

Fig.4 ⩓⩓ Lidded proportional nesting cup weights were typically used on English.platform scales to weigh persons As shown by the inscription on its lid, the 18th century jockey scale from which this set comes could weigh up to 16 stone = (224 lb). This scale has no graduations on its very short beam, as it was intended only to ascertain the jockey's handicap. Note that here, both 'ounces' and 'stones' are pluralized without adding 's'.

The weighing machines in question were mainly steelyards which, in all probability, were of some considerable age (a traditional British steelyard is particularly indestructible). Those submitted for verification would therefore be existing machines re-tested after new knife edges, etc, had been fitted. In the interests of harmony and goodwill the verifiers probably continued to accept these well established scales, as no harm or public detriment would be recognised by their continued use.

The Board of Trade finally intervened however in 1934, when they issued a memorandum stating that no new machines, graduated in 8lb units, could be accepted after 31 January 1935. Furthermore, no existing machines would be re-stamped after the end of 1939 (it is not clear how the commencement of World War II affected this second deadline).

The edict did, however, apparently end this particular anomaly and the London stone eventually disappeared. This was not however the absolute end of the eight pound unit in Britain.

The British Post Office used to be owned and operated entirely by the state and as such was considered to be Crown Property, in the same way as the armed forces still are today. As such, it was exempt from the strictures of the Weights and Measures Act and, routinely, used an 8lb weight in conjunction with its parcel scales (many members will have these quirky ring weights in their collection). The Post Office changed its status in the early 1970's and finally had to abide by the same rules as everybody else. This meant that the offending items had to be removed from service.

The Weight of the People

The stone is an ancient British unit whose actual origin appears somewhat obscure. To those of us (still) acquainted with Avoirdupois, the stone is fourteen pounds which appears to be derived from the unit associated with the wool trade, once the prime source of England's great wealth.

A statute of 1389 defined the unit as being 14lb in order to allow this vital trade to be carried out in every shire on a fair and even basis.

It appeared, despite the principles espoused in the Magna Charta, to be quite acceptable to have a multiplicity of conflicting units associated with different trades. Hence, a whole host of stones existed at different times for different types of merchandise. The connecting theme was that all the commodities were ones traded in bulk, be it lead or glass or wholesale food products such as cheese, spices, sugar etc. All such merchandise had their stone which in turn, made up a similarly

⩓⩓ Fig 5 Quarter stone ring weight

⩔⩔ Fig. 6 Quarter stone bar weight.

motley collection of sacks, loads, formels, lasts, hundred weights, etc. These apparently contradictory units continued to coexist, somewhat uneasily one suspects, until comparatively recent times. As late as 1862 there were said to be fourteen different stones still in use in these small islands. This of course was nearly forty years after an Act had been passed with the intention of 'ascertaining and establishing uniformity of weights and measures'.

The Act of 1824 decreed that the troy pound should be the primary weight unit, rather than the avoirdupois pound that people actually used (this has a familiar ring in these days of enforced metrication). Had the official will prevailed the stone would likely now be a distant memory, but in the best traditions of singing fat ladies failing to deliver their finales, things transpired otherwise.

Fig. 7 ⅄⅄ Courtesy of the Victoria and Albert Museum, no. 825577

Wool weight of George I, second issue, 7 pounds (half a stone) showing the front part of three lions to theleft of the vertical dividing line and a rampant lion to the right. The inspector's mark is that of Lincoln Holland. Wool weights were made from about 1500 until about 1820 for use in buying wool on the farms.

People largely ignored the troy pound (a piddling little unit of distinctly foreign mien) and carried on doling out their merchandise in gutsy avoir; a proper pound whose size perfectly matched their appetites, and chimed most harmoniously with the gallon, yard and bushel. Higher powers, indeed, seemed to intervene on the side of the populace and struck down the wretched troy standard in a ruinous conflagration at the Houses of Parliament in 1834. The Imperial system was reinstated in 1855 when the Avoirdupois pound took its proper place as primary standard and by 1878 troy had been reduced to a mere ounce, for use in transactions involving precious metals.

In a further rebuff to officialdom people also ignored the later decimal options in the series of permitted values and continued to stick resolutely to the traditional series based on values divisible by seven. Thus the fourteen pound stone became an integral part of the Imperial system and very much the unit of choice for those engaged in bulk commodity transactions.

When I joined the weights and measures service in the 1960's, I was fascinated by the septimal series that predominated in commercial transactions. In rural areas and in certain urban trades the stone was routinely quoted. The weight may have been marked 56lb, but to the user it was 'four stone'. When I, later, worked in a major fishing port I was surprised to find that the industry was entirely conducted in stones. The fish was sold on the quay in 10 stone kits, the merchants filled their orders to retailers in stone and half stone lots and even used weighing equipment calibrated in the unit (this being very unusual for trade machines). When working in rural areas we would routinely find ancient weights of non-uniform design still in use for trade. They were technically illegal but a relaxed attitude was taken provided they could be adjusted to their correct values. More problematical was the occasional 3½lb weight that would turn up in the course of an inspection. These were clearly leftovers from a bygone age, whch had most likely been dredged out of the back of a barn to show the inspector. The quarter stone had long been superseded by the 4lb and had to be, reluctantly, confiscated, much to the disgust of the owner, who regarded it as a perfectly logical component of his set of weights.

(At the time these were consigned to the scrap bin, whereas today they would probably be sold to ISASC members.)

Long after the stone was officially removed from the list of units legal for trade use (in that long drawn out journey towards compulsory metrication) it was still routinely being quoted on notices set up at farm gates where produce was for sale. I would wager that such notices still exist today in country areas where metric is still 'something foreign.'

It cannot be overlooked that the stone is still, literally, the weight of the people as it is that which we, or at least those of us who dare to, use to weigh ourselves.

I think it will be many years before the British start to see themselves as consisting of kilograms instead of stones despite any official pronouncements on the subject. In the privacy of the nation's bathrooms therefore, the stone, one of our most ancient units, is destined to live on long after the ton, hundredweight, quarter and dram, let alone the bushel, peck, gill, scruple and minim have become but distant memories.

Fig. 8 ⋏⋏ This complete set of proportional nesting weights comes from an early 19th century person scale made by Avery. It has beams graduated 0-16oz and 0-1lb plus the cups, which are engraved 1 , 2, 4, 8, and 16 stones. Such scales were used first in private clubs and later by physicians. Note that 'stones' is here pluralized with the 's.'

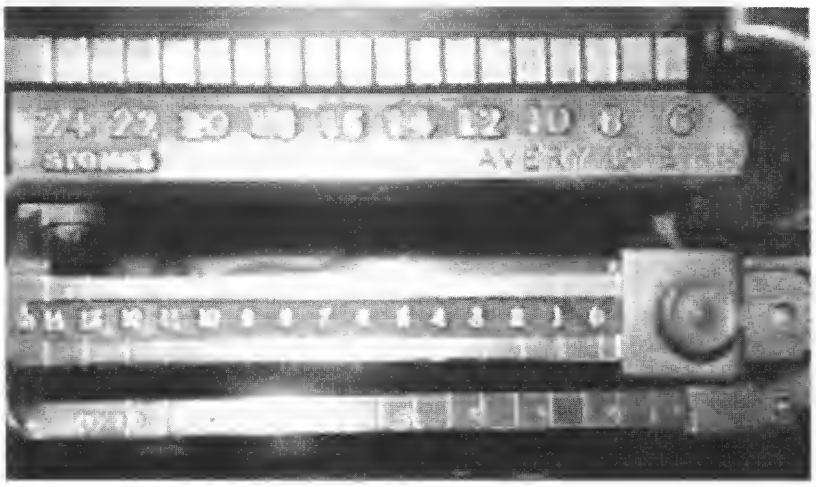
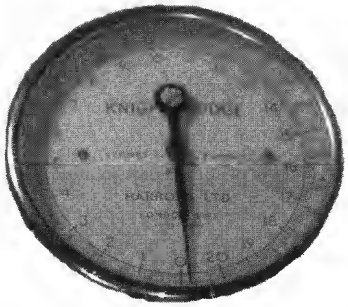
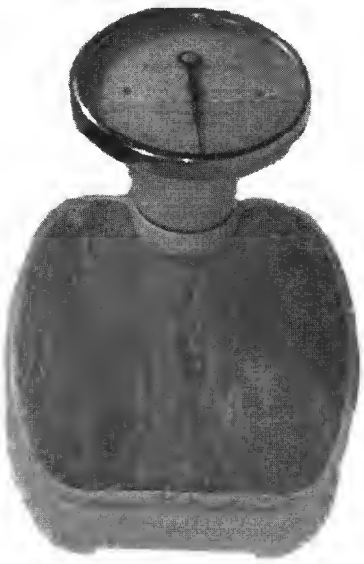


Fig. 9 ≺≺ These 3 beams are on a simple platform jockey scale made by Avery Ld., purchased from W. Thornhill & Co., and presented to J P Cross by CWS (the Cooperative Wholesale Society), XMAS 1894. The three beams are graduated 0-16 oz by 1 oz, 0-14lb by 1 lb, and 0-24 stones x 2 stones.



Figs 10 ≺≺ & 11 ≻≻
Written on the dial of this bathroom scale is "The Knightsbridge, Stones and Pounds, Harrods LTD, London SWI, British Made." The capacity is 20 stones or 280 pounds.

British bathroom scales are still calibrated in both stones and kilograms.



The Way We Were-The Way It Is

BY LUCY M MAISTROS

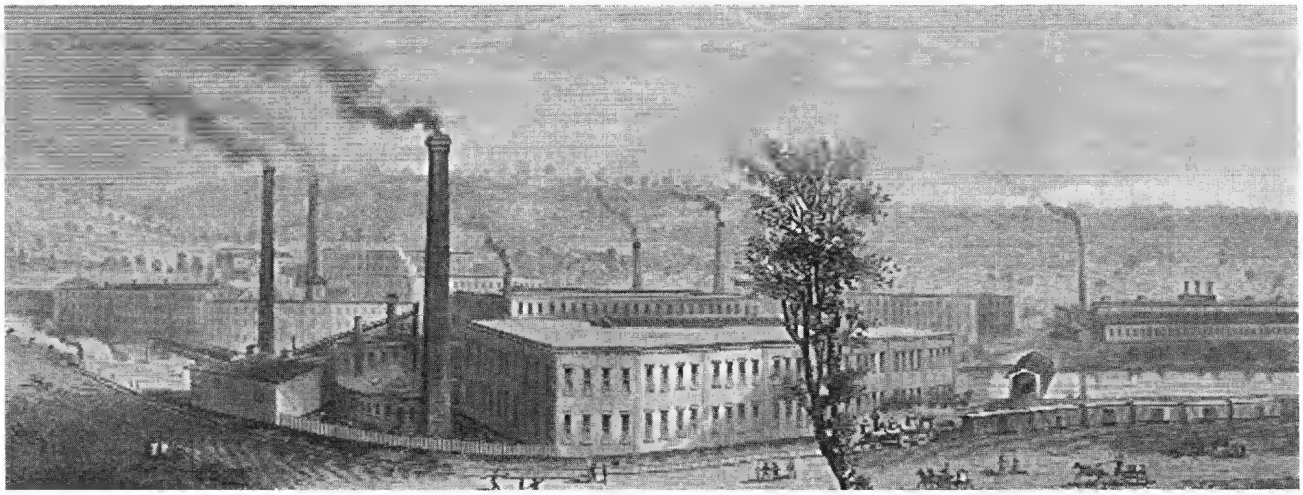


Fig. 1 ⅄⅄ By September, 1963 the Fairbanks Management had concluded that this complex of buildings, put together between 1831 and 1890, was too antiquated to be functional. They were weighing a decision to move its operations out of state. The town was given about a month to come up with a plan to keep the factory in St. Johnsbury.

As I sit to write on this soggy November morning, Fairbanks Scales is on strike. Seventy union workers, out of a total of about 100 employees at this Fairbanks location, march in circles in front of the factory on Route 2 in St. Johnsbury, Vermont, along with fellow union members from all over New England, waving picket signs at management staff and eliciting supportive honks from passing motorists.

Only one hundred employees. Forty years ago it felt like everyone in my hometown worked at Fairbanks. Indeed, about 600 people did. Fairbanks wages directly supported at least a quarter of the population, as well as over 400 businesses. We were a company town, with all that it meant, and we thought it would always be that way. *Company town* when I was young meant marking time by the Fairbanks whistle; it started the workday for our fathers, and summoned us home from the Kiwanis swimming pool on summer afternoons. "Come home when the whistle blows," our mothers would say. It meant enjoying the Fairbanks Museum of Natural Science and the Fairbanks Athenaeum and Art Gallery. And it meant prosperity. Although there were other employers in the area, as went Fairbanks – so went the town.

⅄⅄ Fig. 2 Facilities like the Museum of Natural Science were among the advantages provided in a company town.

Then, in the last week of September 1963, company vice president Edwin Rousch dropped a bomb in the final round of that year's union contract negotiations: Fairbanks Morse Scales, blaming antiquated facilities and equipment, was weighing a decision to move its operations out of state. And if they decided to do that, ". . .we would then negotiate matters related to orderly shutdown." Because the union contract expired November first, the town had about a month to come up with a proposal to keep Fairbanks in St. Johnsbury. Oh,

1963

FAIRBANKS MORSE WEIGHS FATE OF ST. JOHNSBURY PLANT

Final Round negotiations for the future of Fairbanks Morse & Co. of St. Johnsbury opened on a note of urgency here yesterday afternoon.

Edwin F. Rosch, company vice president for administration, headed a group of company officials during talks wit St. Johnsbury plant personnel, union representatives, and town officials.

Rosch said the compny was weighing three alternative proposals for the future of its operations in St. Johnsbury..

Alternatives

1. Build a modern plant and purchase modern equipment at St Johnsbury.
2. Build much larger modern facilities and operations of the weighing division in St. Johnsbury
.3. Close the St, Johnsbury plant and centralize weighing division operations at another location.

Fig 3

and by the way, they would need about five million dollars to build a new plant!

Orderly shutdown? It didn't look good. You didn't need a scale to measure the economic impact that the loss of Fairbanks would have on this otherwise quiet little corner of New England that has always been known more for its scenic beauty and rocky farmland than booming industry. More than $50,000 a week in wages flowed from the brick factory sprawled on the banks of the Sleeper's River to the dignified old houses on Main Street, and the bustling shoe stores, pharmacies and banks on Railroad Street.

It had all the makings of a Frank Capra movie: a picturesque community, serene in this Green Mountain valley, up to its shoulders in an explosion of red and gold maple leaves that was interrupted only by the brilliant white steeple of the South Congregational Church. And a cast that included industrious workers, scrappy union leaders, powerful company owners, and a watershed event that threatened to inundate the Passumpsic River Valley with more economic woes than the flood of 1927.

Like the people of Bedford Falls in *It's a Wonderful Life*, the citizens and leaders of St. Johnsbury rallied to try to keep Fairbanks in the town where it was born. The workers of Union Local 234 agreed to extend their contract at least three months past the expiration date. The Fairbanks-Morse Development Fund was founded to seek funds to help finance a new manufacturing facility, as well as a show of support from the community. The initial goal was set at $250,000.

Only a few days after the announcement, the stunned workforce—whose wages averaged $90 a week—had already raised over $44,000. And these people hadn't even warmed up yet. The sounding of air raid sirens and the ringing of church bells celebrated the first goal of $250,000, reached after only four days. Raymond J. Brisson, then president of the Fairbanks Foundation, later recalled that the Foundation contacted Governor Phillip Hoff at that point and advised, "We had our $250,000 and [we] were going for $500,000."

A "thermometer" was installed in the front of the St. Johnsbury House, Main Street's historic Greek Revival Hotel, to mark each milestone in the pledge drive. Andrea Neil was a freshman at St. Johnsbury Academy that fall. "I remember going down to the St. J. House after school to see how much money had been raised. It was exciting to watch the numbers go up as the pledges came in." Support came from everywhere. Governor Hoff, Vermont's, appointed Albert Cree, president of Central Vermont Public Service, the electric utility, as his personal representative in the fight and promised that he himself would be there when it came time to present the proposal package to Fairbanks senior management. He also appealed to the State of Vermont and its Vermont Department of Development for help in obtaining financial support.

This was the biggest coordinated effort St. Johnsbury had seen since Pearl Harbor. Churches pledged funds; children sold lemonade, and a battery of volunteers called their neighbors to ask for pledges.

Cecile Smith, housewife and mother of three, recalls "There were ads on the radio, WTWN, for volunteers to collect pledges, so I packed the kids in the back of the car and drove around town." Everyone pledged something, big or small. Teachers at St. Johnsbury Academy, widows, trucking companies, beauty shops, the Rotary Club, and even Danville, a town 9 miles away, got involved through their Chamber of Commerce. Meanwhile, St. Johnsbury town officials considered tax stabilization programs for local industry to be proposed at the next town meeting in March.

By October 3, *The Caledonian Record* reported, an astonishing $532,000 had been pledged–more than 10% of the $5 million that the company said it would need to build a new plant.

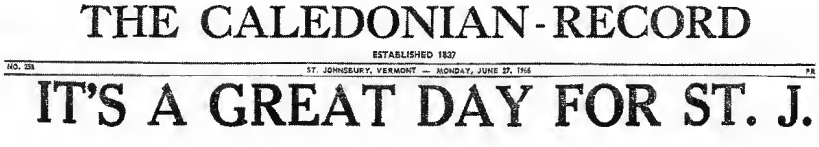
Fig. 4 The workers of Union Local 234 voted to extend their contract at least three months past the expiration date.

Meanwhile, in their high-rise Manhattan offices, Fairbanks senior management continued to deliberate the future of *St. J.* through a bleak November made more so by the assassination of President Kennedy. Weeks later, as the New Year dawned, no one knew if 1964 would bring rescue or disaster.

At Bricketts Diner on Railroad Street, men sat in the haze of cigarette smoke and spoke about what they would do if Fairbanks made good on their threat. *Move out of town*, was what most of them planned to do, including my father, himself a skilled machinist at Fairbanks since 1945.

Typical was Clayton Morris, a 44-year veteran of Fairbanks. His words spoken at that time were later published in U.E. Local 234's Fiftieth Anniversary booklet. The third generation of his family to work at Fairbanks, he'd held this job since his discharge from the Navy in 1919. His father had spent a lifetime there—55 years. "A fellow my age, 62 years, just can't go out and get a job," said Mr. Morris. There were also many couples that worked at Fairbanks. Harold Hill was a planer operator and his wife worked in the office. The closing of Fairbanks would force them to leave town. "We were born and brought up here," Mrs. Hill said, "but if the company leaves we would have to go."

Fig 5


THE CALEDONIAN-RECORD

ESTABLISHED 1837

NO. 238 ST. JOHNSBURY, VERMONT — MONDAY, JUNE 27, 1966 PR

IT'S A GREAT DAY FOR ST. J.

Finally, on April 9, 1964, dramatic headlines in *The Caledonian Record* announced, "Griebel says Firm Will Stay." At noon that spring day, the president of Fairbanks Morse had announced to a large crowd gathered at the St. Johnsbury House, that although they had not come to a decision whether to build a new plant or renovate the old one, "We will maintain a major scale manufacturing operation in St. Johnsbury." He went on to say "The willingness of St. Johnsbury residents last winter to pledge more than a half million dollars of their own personal funds toward assuring the capital necessary to finance such modernization (of the plant) is, to my knowledge, *unique in American business history*."

In fact, the strike last November was settled in two weeks, and Fairbanks lives on in St. Johnsbury, albeit downsized from the Fairbanks of my youth. Many scales are now manufactured in China, and part of the plant is building is leased to other companies.

As for the old Fairbanks, the Fairbanks Motor Inn, complete with in-ground swimming pool, now occupies part of the land where the old Fairbanks plant used to be. Grass grows where the foundry once stood and Interstate 91 slices through the hillside that once looked down on the company store. On Main Street, brick mansions still hold court, and the cultural legacy of the Fairbanks family lingers on in the Fairbanks Museum, the St. Johnsbury Athenaeum and Art Gallery, and St. Johnsbury Academy, a nationally-renowned college-prep school.

Eventually, the decision *was* made to construct a new plant. With financing, architectural and construction decisions yet to be made, it was still three more years until the groundbreaking for the new 221,000 square-foot facility, on June 27, 1966. Once again, Governor Hoff addressed a crowd of people in St. Johnsbury, but this time from a rostrum perched in the grass on the site of the new plant. And by the following summer, machinery hummed on the new concrete floors.

So, in the new millennium, as I watch picketers march on Warren Flats in front of the "new" plant, I wonder, *Will there still be a Fairbanks Scales in St. Johnsbury when this strike is over? Will Fairbanks threaten to move out again?* Fairbanks may someday once again be in jeopardy, but the town that Fairbanks built will live on. The people will make sure of it.

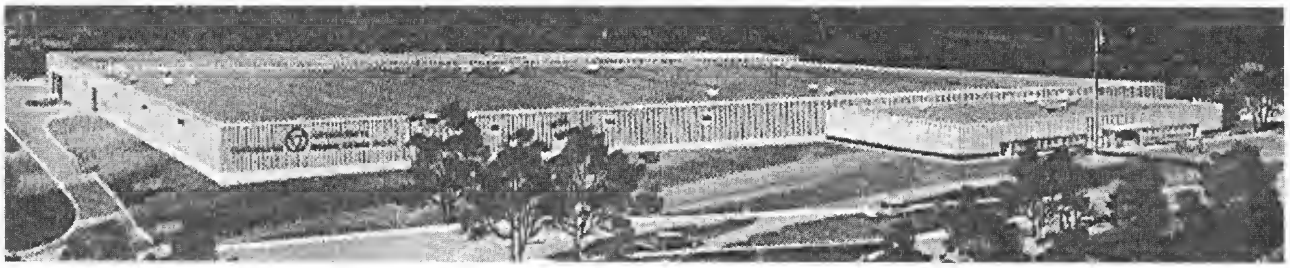


Fig. 6 The "new" Fairbanks plant, which opened on June 27, 1966, is a 221,000 square-foot facility. With many scales being manufactured overseas, part of the plant is leased to other companies.

Acknowledgements

I am indebted to the following for their help in obtaining research material.
Stewart and Cecile Smith, library research
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Susan Maurice, Administrative Assistant, St. John's Church
Local 234's 50th Anniversary brochure
The Caledonian Record
Images of America by Claire Dunne Johnson, Arcadia Publishing, 1996
The Town of St. Johnsbury by Edward T. Fairbanks, Cowles Press, 1914
St. Johnsbury Past and Present by Lowell Smith, The Cowles Press, 1937

About the Author.

Lucile Maurice Maistros was born and reared in New England but now writes and lives on the shores of Chesapeake Bay. She began her writing career as editor and writer for a local newspaper and shoppers guide, later serving on the editorial staff for a major corporate newsletter and company magazine. She has summarized technical papers for the monthly , *National Bureau of Economic Research Digest* and has been published in *Unique Opportunities*, a physician recruitment magazine. Lucille loves history and is currently writing a book about growing up in New England.

US Patents 1881-1882

TEXT BY R HENDRICKS WILLARD
CAPTIONS & RESEARCH BY J H BERNING

Mark Twain said it best. Hank Morgan, the protagonist in Twain's novel *A Connecticut Yankee in King Arthur's Court*, stated, The very first official thing I did, in my administration-and it was on the first day of it too-was to start a patent office, for I knew that a country without a patent office and good patent laws was just a crab and couldn't travel any way but sideways and backwards. In the decades following the Civil War, Americans found themselves in a country almost as foreign to them as King Arthur's Court was to Hank Morgan.

The 1876 Centennial Exposition held at Philadelphia marked a turning point in the history of the nation, between a culture with an open frontier of unexploited land for settlers and a nation whose new frontiers were of unexploited technology for manufacturers and inventors. Alexander Graham Bell gave one of the first demonstrations of his new telephone. The Patent Office sent a carefully chosen 5,000 models of inventions for exhibit in Philadelphia. But, as stated by Patent Commissioner William H Doolittle, the models were not needed to illustrate the value of the patent system. Every hall of the Exposition was filled with machinery and manufactured articles that illustrated the fruits of the patent clause of our Constitution far beyond the power of a few miniature models. It attracted exhibits and visitors from all over the world.

A Swiss shoe manufacturer and Commissioner to that exhibition was so impressed with American technological ingenuity that on returning home he told his countrymen, "We must introduce the Patent System. America has shown us how. May our sister republic serve as our model in this." By 1888, Switzerland had indeed introduced a patent system. Albert Einstein later became a Commissioner for the Swiss Patent Office.

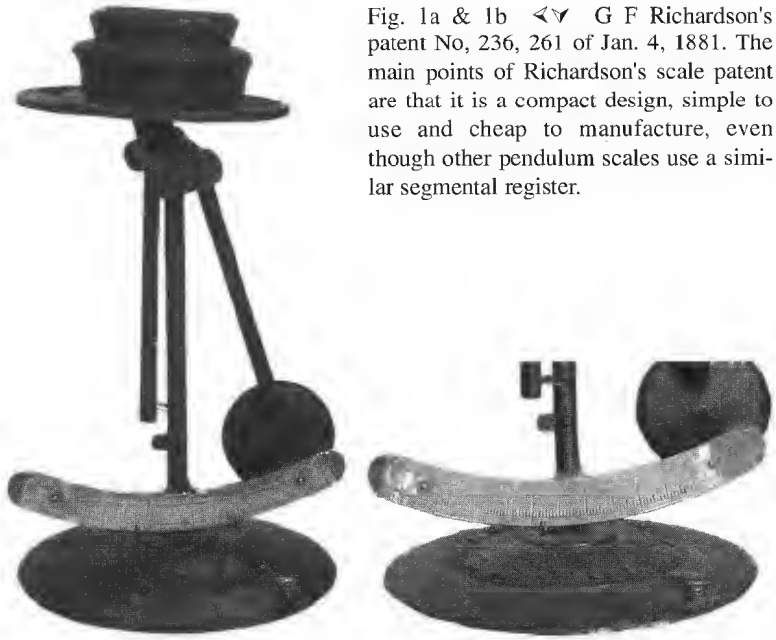


Fig. 1a & 1b ⋖⋎ G F Richardson's patent No, 236, 261 of Jan. 4, 1881. The main points of Richardson's scale patent are that it is a compact design, simple to use and cheap to manufacture, even though other pendulum scales use a similar segmental register.

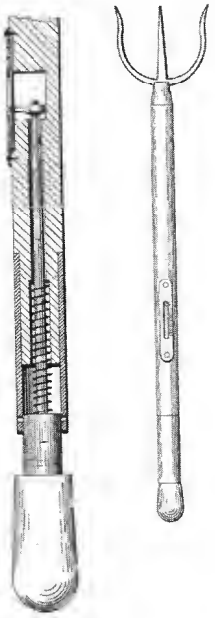


Fig. 2. ➢➢ G A Stewart's patent no. 268,747 of Dec. 5, 1882. A simple spring scale is built into the handle of this hay fork. The fork is thrust into the hay and then raised to a vertical position. Resting on the knob, the weight of the hay is indicated on the graduated scale on the handle. It is also equipped with a locking pin to disengage the scale when it is being used as a hay fork. By turning the knob section, it can be adjusted to zero, a necessity for the rough handling a device like this is sure to receive.

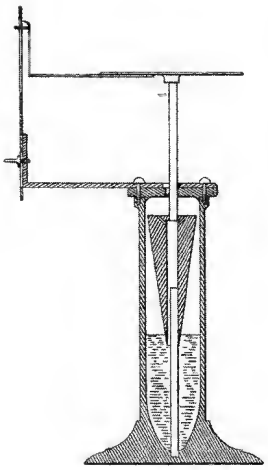
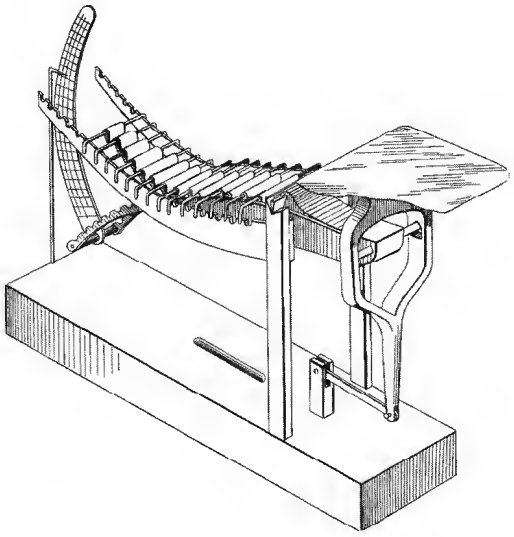


Fig. 3. ⮝⮝ J B Atwater's patent no. 264,432 of Sept. 19, 1882. The idea behind this postal scale is to reduce the friction of moving parts to achieve greater consistent accuracy. The conical ivory or glass plunger floats in a tube of mercury. As the letter is placed on the plate, the plunger is forced up by the mercury, and the weight is indicated on the upright graduated scale.

Fig. 4 ⮝⮝ J F Miller's patent no. 276,701 of May 1, 1883. A weight lifting, postal, computing scale, similar to the rolling pin scales of England. As the letter is placed on the letter plate, the fi ounce weights are lifted consecutively until the correct weight and postage is indicated on the graduated arc. Another version of the patent states that the arc may be fixed and the pointer moves. There is no provision in this patent to secure the weights within the scale.



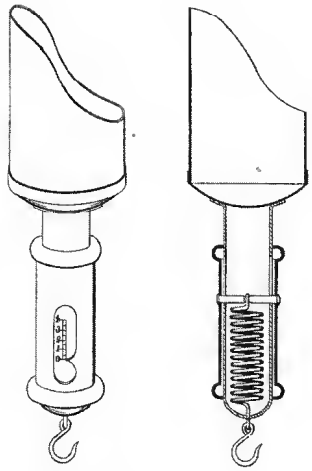


Fig. 5a & 5b. ⮝⮝ I L Bevis's patent no. 271,210 of Jan. 30, 1883. Designed to measure flour, sugar, and other similar food items. It is a simple spring scale, with the spring inside the handle. When held in the vertical position, the weight of the load is indicated on a graduated scale in the handle. It also has a hook at the bottom so it can be used as a spring scale to weigh other items. The patent shows a shovel type for weighing butter in the same way.

The year 1881 inaugurated one of the greatest decades of invention of all time. Within those ten years the trolley car, the incandescent light, the automobile, the cash register, the dynamo, the pneumatic tire, smokeless powder, transparent film, electrical welding, the cyanide process, the steam turbine, the manufacturing of aluminum, and the electric furnace appeared in the marketplace.

Concurrently the hundreds of small local railways, many no longer than 40 miles, began merging and consolidating their systems. In 1883, the American Railway Association divided the country into four time zones, with an hour's difference between each and in spite of outraged cries of God's time! regularized their timetables.

Scalewise, inventors were busily patenting devices to facilitate the transformation of American agriculture and industry from a rural agrarian system to one of large-scale production and marketing. Advertising was beginning to influence household habits, and families who had formerly made do with scale or two to weigh crops, feed, or eggs began acquiring specialized scales for use

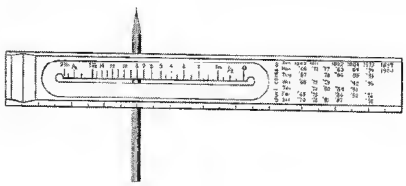


Fig. 6. ⮜⮜ A B Upham's patent no. 290,945 of Dec. 25, 1883. This combined measure and scale was designed to measure distance as well as to weigh letters, packages, or pails. The rule has a V shaped notch at one end in order to hold cylindrical items of any diameter. A pencil serves as the fulcrum and the scale is slid on this fulcrum until balanced.

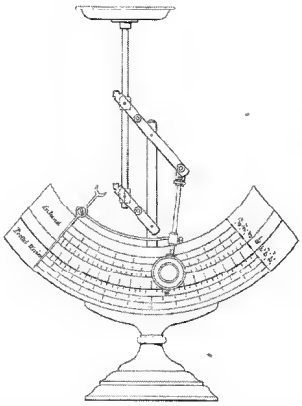
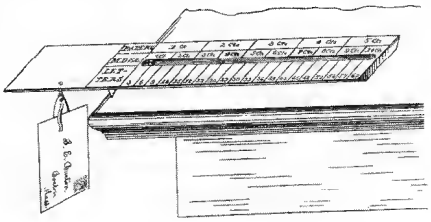


Fig. 7. ≺≺ M J Albracht Jr's patent no. 250,413 of Dec. 6, 1881. Albracht Jr. of Amsterdam, Netherlands, designed this scale much like the more common European quadrant postal scales. Rather than having a dial that is offset to the right or left, the dial is symmetrically located on the base. His scale also incorporates a postage rate chart for letters, printed matter, and merchandise.

Fig. 8. ➢➢ S E Barton's patent no. 243,753 of July 5, 1881. This combined desk ruler an.d scale could be used as a straight edge and paper cutter as well as a letter scale with postage rates. This ruler scale was used on a table edge. The hook was designed with a tongue for holding letters for weighing and a hook for weighing small packages.



in their household affairs. As more and more families dispersed across the nation, the railroads carried mail over long distances in days rather than weeks, and people became accustomed to exchanging letters about ordinary family life rather than limiting their correspondence to major events such as births, weddings, and deaths. Eager to profit from their inventions, patentees devised numerous multipurpose scales for household use. These could weigh letters or packages, measure length, reveal how many pints of beer were in the refrigerator without opening the door, or, on a larger scale, how many pounds of hay were on a pitchfork. Businesses inscribed their logos and other advertising on scales that they gave to their customers as a sales promotion. The modern age of consumerism had begun.

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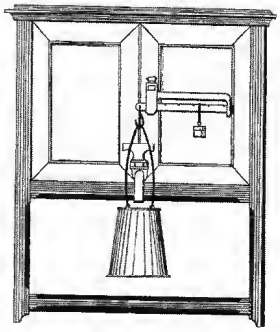


Fig. 9. ≺≺ P Vaughan's patent no. 290,153 of Dec. 11, 1883. This beer scale is attached to the front of a refrigerator, ice box, or ice chest. A spigot, attached to a keg, projects through the chest. As beer is drawn into the vessel under the spigot, it is weighed on the beam scale. The beam is hinged so that it moves 90° in order to enable the user to change the beer keg.

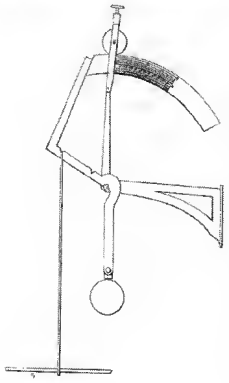
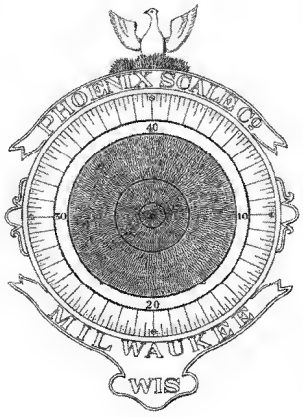


Fig. 10. ≺≺ J B Atwater's patent no. 253,659 of Feb. 14, 1882. Designed to be mounted on a wall. His idea, was a wheel at the top to ride on the arc. This would reduce the oscillating effect of the scale for an instant weight. The arc is graduated to a capacity of 4lb or 12lb, depending on which notch of the arm the bail is hanging on.

Fig. 11. ⋎⋎ T A Lusk & F Huebner's design patent no. 12366 of July 19, 1881. This face plate and frame for a family scale was designed to be pleasing to look at while announcing the name, symbol, and home city and state of the Phoenix Scale Co.



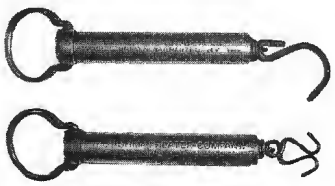


Fig. 12a & 12b. ⩓⩓
J S George's patent no. 273720 of Mar. 13, 1883. Designed to fit in a pocket and manufactured by Triner Scale Co. They are 2¾" long excluding the hook and ring.spring scales which have an adjustment to compcnsatc for wear and strain on the spring. The letter scale version of this scale, with its double hook, has a capacity of 4lb by ounces. Its back shows an advertisement for The Ashman Heater Company in New Paris, Ohio. The other is marked 'Victor sporting or pro-fessional scale Capacity 16lbs. By ¼lb. Manufactured and warranted by the Triner Scale & Mfg. Co. Chicago, IL.'

No.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
236,261	Jan 4, 1881	G F Richardson	Montague, MA	G A & J H Clapp	Pendulum Scale
238,841	Mar 15, 1881	S H Brackett	St. Johnsbury, VT	E & T Fairbanks Co	Magnetic support for beam
239,771	Apr 5, 1881	J R Haight	Adman, MI		Automatic Indicating Scale
241,363	May 10, 1881	I S Hopkins	Oxford, GA		Pocket Scales
242,086	May 24, 1881	A Westermaier	Philadelphia, PA		Adjusting Scale
243,186	June 21, 1881	A Williams	Ingleside, PA		Net Weight weighing scale
243,539	June 28, 1881	J S Fray & H Pigg	Bridgeport, CT		Spring Bal w/tare Device
243,753	July 5, 1881	S E Barton	Boston, MA		Desk Ruler/ Letter Scale
D12,366	July 19, 1881	T A Lusk & F Huebne	Milwaukee, WI		sFace plate & frame for scale
244,449	July 19, 1881	J Graves & A W Partrick	E Orange & Newark, NJ		Measure & Weighing Scale
246,057	Aug 23, 1881	A Abbott	Brooklyn, NY		Balance Scale
246,318	Aug 30, 1881	C F Kleinsteuber & F Huehner	Milwaukee, WI	Mil Phoenix Sc Co	Table top platform scale
247,366	Sept 20, 1881	C F Kleinsteuber	Milwaukee, WI	Phoenix Scale Co	Pendulum Scale
247,761	Oct 4, 1881	W W Hopkins	Thorntown, IN	Hopkins Improved Sc Co	Computing scale
248,177	Oct 11, 1881	W W Hopkins	Thorntown, IN	Hopkins Improved Sc Co	Support for platform scale
249,483	Nov 15, 1881	W W Reynolds	Rutland, VT	Howe Scale Co	Platform scale
250,413	Dec 6, 1881	M J Albracht Jr.	Amsterdam, Netherlands		Pendulum mail scale
251,087	Dec 20, 1881	S J Austin	Terre Haute, IN		Scale for weighing bushels
252,070	Jan 10, 1882	T W Boyle	Augusta, GA		Scale for hand truck
252,452	Jan 17, 1882	V M Fulcher	Hughes Springs, TX		Indicator for scales
252,608	Jan 24, 1882	L Kyser & A C Rex	Philadelphia, PA		Toy scale
253,659	Feb 14, 1882	J B Atwater	Chicago, IL		Hanging pendulum scale
254,502	Mar 7, 1882	F D Payn	Albany, NY		Automatic weighing scale
255,132	Mar 21, 1882	C Becker & P Jacob	Chicago, IL		Liquid measurer & scale
256,423	Apr 11, 1882	W W Wright	Cairo, IL		Overbalancing alarm
256,502	Apr 18, 1882	W W Reynolds	Rutland, VT	Howe Scale Co	Platform scale
256,768	Apr 18, 1882	B Torras	Brunswick, GA		Pendulum scales
258,287	May 23, 1882	J Dolph	Bay City, MI		Barrel scales
258,476	May 23, 1882	C H Roberts	Montour, IL	1/2 to O H Mills	Grocers scoop scale
259,338	June 13, 1882	G Smith & J J Wells	San Francisco, CA		Coin tester
260,415	July 4, 1882	W W Reynolds	Rutland, VT	Howe Scale Co	Grocer's scales
262,905	Aug 15, 1882	F A Roeder	Cincinnati, OH	1/2 to A Springer	Beam scale torsion bal
262,966	Aug 22, 1882	J B Martin	Cincinnati, OH		Pendulum scale
264,070	Sept 12, 1882	C Forschner	New York, NY		Spring scale

Editor's Note: Patents issued between Sept. 12, 1882 and Dec. 31, 1883, will be published in EQM 2003 NO. 3.

The Life of a Patentee

BY MARSHALL R. ELIZER

Dr. Isaac Stiles Hopkins (b. 1841 - d. 1914), was an 1859 graduate of Emory College (forerunner of Emory University), in Oxford, Georgia. He remains one of the youngest graduates in the history of Emory University. His great interest was in practical mechanics. This is shown by his invention of a folding prescription balance. An Episcopal/Methodist minister as well as a teacher, Hopkins served as president of Emory from 1884-88. He introduced a rudimentary mechanics course while President at Emory. The "Old Gym" (Fig. 1) was built in 1885 during his presidency to house his pioneering technological department. He resigned from Emory in 1888 to develop a technical school with a curriculum adhering to the shop culture in Atlanta.

Because of his interest in technological training, Dr. Hopkins was chosen, in 1888, to be the first President of Georgia Institute of Technology. The Georgia School of Technology opened its doors in October 1888 to eighty-four students. The School's creation signaled the beginning of the transformation of the agrarian South to an industrial economy. A Bachelor of Science in Mechanical Engineering was the only degree offered. Hopkins was the president of Georgia Tech from its founding in 1888 through 1896.

Dr. Hopkins resigned his presidency at Georgia School of Technology in 1896 to pursue a theological career. He served as pastor of St. Johns United Methodist Church in St. Louis, Missouri from 1898 through 1901. He held the degrees of M.D., Ph.D., and received an honorary D.D. from Oxford College in 1881. He died in 1914 and is buried in the old cemetery on the campus of Oxford College of Emory University in Oxford Georgia.

Fig. 1. ⅄⅄ Following Hopkins' departure from Emory College, the shop became a gymnasium. An indoor swimming pool was added later. In 1990, Hopkins Hall was renovated to house the Virgil and Susanne Eady Admission Center.

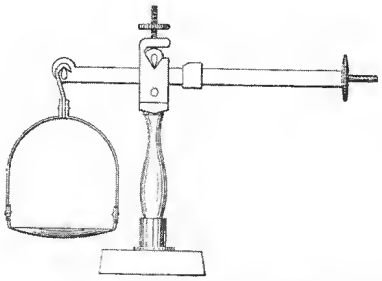


Fig 2 ⅄⅄ I S Hopkins' patent no. 241,363 of May 10, 1881. This small scale was designed for country doctor and family use to weigh medicines and prescriptions. The bail for the pan of this pocket scale is hinged, for folding, so that the scale can fit in a small case to be easily carried by physicians on house calls.

About the Author:

Marshall R. Elizer was born in 1911 in Hillsboro, Georgia. He received his Masters, in History and Education, from the University of Georgia in 1940. Before WWII, he taught High School in Ft. Gaines, Ga., as principal of Molena High School in Molena, Ga. He served in the U.S. Army, during WWII, from 1941 through 1946 and during the Korean conflict. From 1946 through 1978, he was a math professor at Emory at Oxford, Emory University's junior college. He also served as Oxford College of Emory University's Director of Student Services from 1953 through 1971, and as the Business Manager from 1971 until his retirement in 1978. During his tenure at Oxford, he helped to facilitate the conservation of the old cemetery on the campus. He resides in Oxford, Georgia with his wife Fran and is in the process of writing his memoirs.

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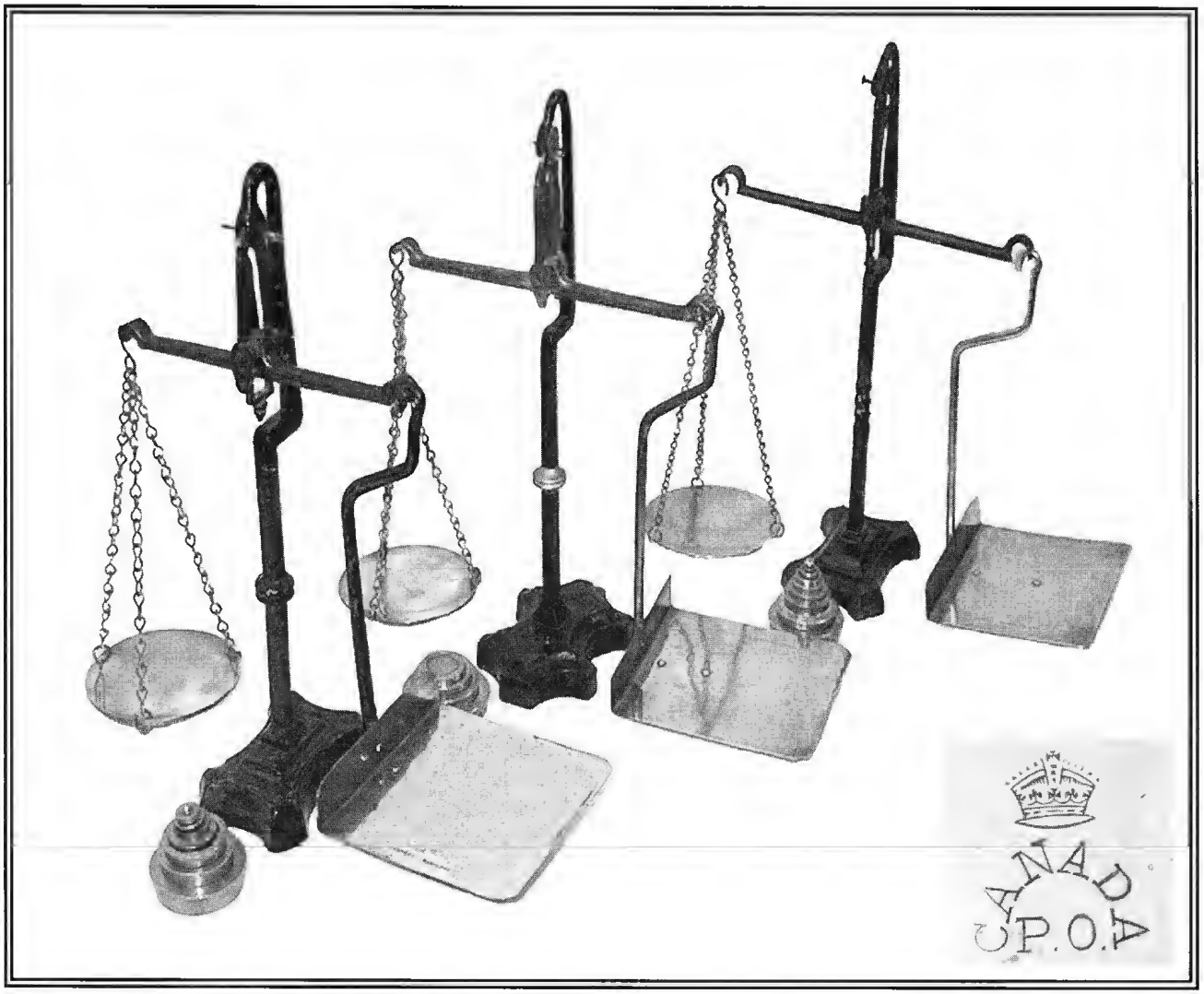
2003 ISSUE NO. 3 PAGES 2813 - 2844



Cover Picture

Over the years many different styles of Postal Scales have been issued under the auspices of the Canadian Post Office. In most cases they were identified with an embossed Crown and a notation "Canada P.O." as shown here. As one might expect, the larger post offices usually had relatively large and sophisticated scales. The thousands of smaller post offices, however, were generally issued the Equal Arm Letter Scale that is the subject of the article beginning on page 2816.

Given the large number of scales required, it is assumed that from time to time the Canadian Post Office put the manufacturing of these scales out to tender. This scale with minor variations has been manufactured by at least four scale companies: the Gurney Scale Company of Hamilton, Ontario; Pritchard & Andrews Co. of Ottowa Ltd.; and Degrave, Short & Fanner of London, England, and laterally, Degrave & Co., London. To my knowledge, none of these companies is in operation today.

A number of the Canadian Equal Arm Letter Scales have survived and now find themselves prominently displayed in collections of many scale enthusiasts in Canada and the United States.

Peter Laycock

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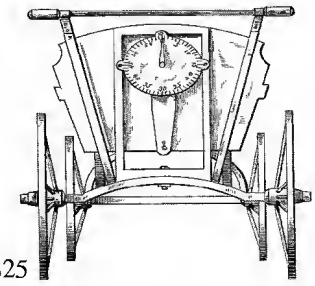

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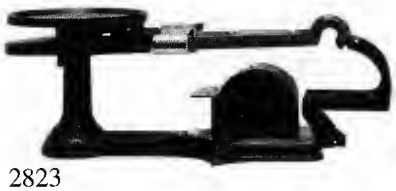

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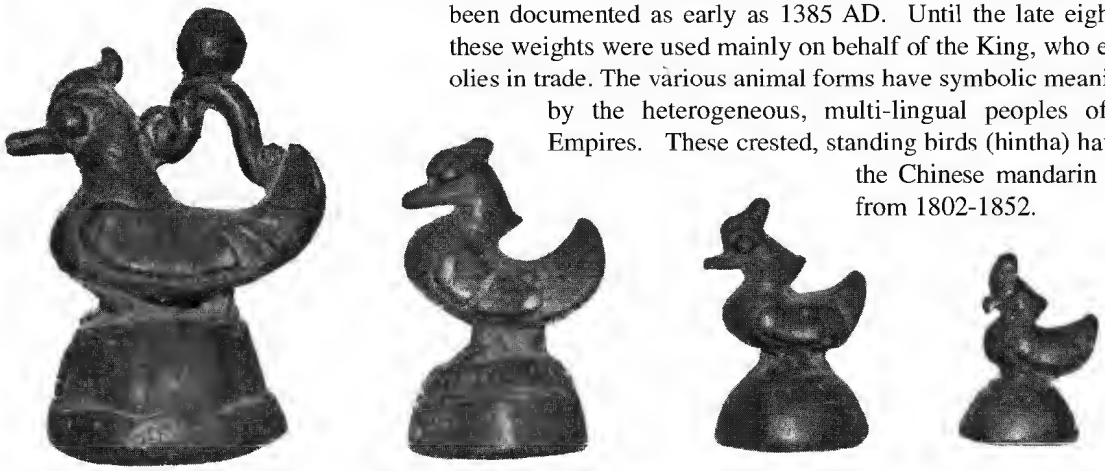
North and South American contributors are requested to send their articles to the Editor. Members of ISASC Europe should send them to John Knights, Swanston Cottage, 35 South Street, Keelby, Grimsby, DN41 8HE England.

Showcase

The royal animal-shaped weights of the Burmese Empires appear to be unique as a weight system. Their use has been documented as early as 1385 AD. Until the late eighteenth century, these weights were used mainly on behalf of the King, who enjoyed monopolies in trade. The various animal forms have symbolic meanings understood by the heterogeneous, multi-lingual peoples of the Burmese Empires. These crested, standing birds (hintha) have the shape of the Chinese mandarin drake and date from 1802-1852.

(See pg 2824)



The Canadian Equal Arm Letter Scale

BY PETER LAYCOCK

As Canada developed throughout the nineteenth and twentieth centuries, many small communities sprung up requiring postal service. By 1900 there were over 10,000 post offices. It seems as though a post office was established regardless of the size of the community. Each of these offices was equipped with the customary assortment of postal paraphernalia: Policy and Regulation manuals, cancellation hammers, mail bags, seals, postage stamps and of course a Postal Scale. (See Fig. 1)

Fig. 1

Mail in the North American British Colonies for both letters and parcels was assessed a fee based on weight since 1844. The first postage stamps were issued in 1851 for the provinces of Canada, New Brunswick and Nova Scotia. Other provinces introduced postage stamps at a latter date. A major piece of legislation, the Postal Act of October 1878, sets out the regulations governing all matters relating to the mail sent to and from Canada. Rates for postage were established and supplied to each post office. (Figs. 2, 3) The act states "The rate of postage on a letter posted within the Dominion of Canada, for transmission by Mail to any place in Canada, is 3 cents per half ounce weight."

In regards to excess weight it states "In calculating the amount of postage due on a letter, care should be taken to ascertain its exact weight. If the half ounce be exceeded to the smallest extent, even though the balance be merely turned, the letter becomes liable to an additional rate." It looks like these people took

Table No. 1

Rates of Postage on letters within the Dominion of Canada (including the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Manitoba, British Columbia, and Prince Edward Island), to Newfoundland and to the United States.

Within The Dominion of Canada

	Posted Prepaid	Posted Insufficiently Paid
On a letter weighing not more than ½ an oz.	3 Cents	
On a letter weighing more than ½ an oz., but not more than 1 oz.	6 Cents	Double the deficient postage
On a letter weighing more than 1 oz., but not more than 1½ oz.	9 Cents	
On a letter weighing more than 1½ oz., but not more than 2 oz.	12 Cents	
On a letter weighing more than 2 oz., but not more than 2½ oz.	15 Cents	

and so on 3 Cents being charged for every additional ½ oz., or fraction of a ½ oz.

The rate of postage on a letter posted within the Dominion of Canada, for transmission by Mail to any place in Canada, is 3 cents per half ounce weight; but the Statute provides that this rate must be prepaid by Postage Stamp at the time of posting the letter.

Fig. 2

XII – Parcels

1. Parcels closed at the ends and sides, and not exceeding five lbs. in weight, may be posted at any Post Office in Canada, for conveyance to any other Post Office in the Dominion (with the exception noted in paragraph 11), at the following rates: —

For each parcel weighing not more than 8 oz	12½ cents
Exceeding 8 oz. and not exceeding 1 lb	25 cents
Exceeding 1 lb. and not exceeding 1½ lbs.	37½ cents
Exceeding 1½ lbs. and not exceeding 2 lbs.	50 cents
Exceeding 2 lbs. and not exceeding 2½ lbs.	62½ cents
Exceeding 2½ lbs. and not exceeding 3 lbs.	75 cents
Exceeding 3 lbs. and not exceeding 3½ lbs.	87½ cents
Exceeding 3½ lbs. and not exceeding 4 lbs.	$1.00
Exceeding 4 lbs. and not exceeding 4½ lbs.	1.12½
Exceeding 4½ lbs. and not exceeding 5 lbs.	1.25

Fig. 3

their responsibility to weigh the mail seriously!

This hardy little scale stands 13 inches tall. The center post is made of forged steel and is mounted on a heavy cast iron base. Typically the base has an embossed crown and or an embossed "Canada PO." It is painted black and is often decorated with a gold and red pin-stripe accent. Suspended from the arm is a circular brass weight tray held in place by brass chains. The weight tray generally has a Crown and "Canada PO" stamped into the metal by a die establishing it as property of the Post Office (See cover picture.)

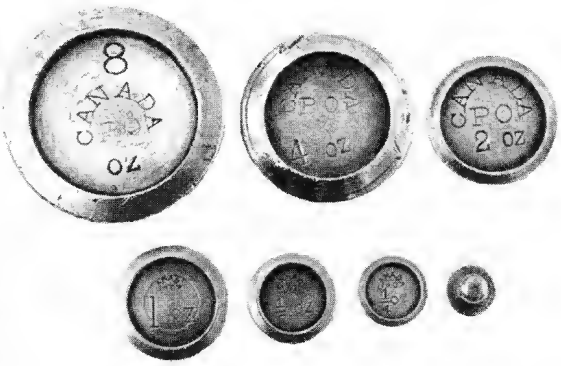


Fig. 4

The letter tray is made of brass and is mounted on a steel or brass suspension rod. It often bears the Crown and "Canada PO" designation. As well, all of these scales that I have seen have the name of the manufacturer stamped into the letter tray. Three of the six scales that I own have an additional set of numbers stamped into the letter tray which I assume are serial numbers affixed by the Post Office.

The seven stackable weights issued with these scales range from 1/4 ounce up to 8 ounces. They are typically stamped "Canada P.O." (See Fig. 4)

According to the Canadian Postal Museum these scales were standard in smaller post offices from late nineteenth century to the mid-twentieth century. From studying Weights & Measures verification marks and inspection labels it would appear that some of these scales were in use until the late 1970s. Indeed there may still be the odd small post office that uses one of these scales today.

The weights and trays were periodically checked by the Department of Weights and Measures. Until the early 1960s verification marks were stamped into the weights and trays with a metal die. Later, a paper seal that was glued to the scale confirmed an inspector's visit. (See Figs. 5, 6, 7)

Often one or more of the weights were lost and additional replacement weights had to be supplied. These too were verified to ensure that whichever set was currently at the post office had the inspectors blessing.

Unfortunately most of these scales were either recalled or have found their way to the dump as the post offices were either closed or upgraded to more recent technology. Every so often one of these scales pops

Figs 5, 6, 7 Examples of traditional inspectors' verification marks as used until the early 1960s.

up. It is rare however to find one with a complete set of original Canada Post Office issued weights. These scales had one more kick at the cat when in 1990 the Canadian Post Office issued a set of six postal stationery envelopes that depicted scales that had been used over the years by the Canadian Postal Service. The Equal Arm Letter Scale was selected for the 40 cent envelope where it is proudly portrayed in full color. (See Fig 8.)

About the Author

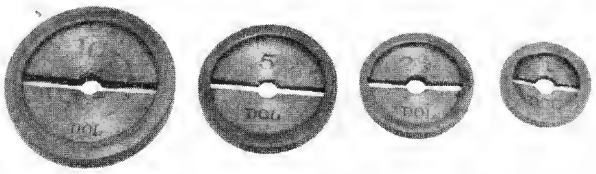
Peter Laycock has been a collector of stamps and postal history since the age of seven. This interest in philately ultimately led him to collecting other postal paraphernalia including stamp boxes, cancellation hammers, and postal scales. He began collecting postal scales in earnest about ten years ago and now has more than 400 postal scales of all types and sizes. Peter traveled extensively in his work which gave him an opportunity to seek out postal scales all over the world. Now retired and living in Toronto, he continues his interest in scales and has finally found the time to display them in his home so that he and his grandchildren can play with them.

Fig. 8

A Somewhat Amazing Revelation

BY JEROME R. KATZ

For years, collectors have been assuming that this little rocker, which is unsigned, was made to weigh only the $20 coin, and was produced in the period circa 1875.



But as the the photos accompanying this article will reveal, all those rockers were incomplete. In addition to checking the $20 gold coin, the CCD has the capability to check the $1, $2.50, $5, and $10 coins as well. Brass inserts designed to accept each of those four additional coins are nested into the $20 slot as needed. And then the coin in question is fitted into it for checking.

Since there is no insert for the $3 gold coin, this CCD would most likely pre-date 1854.

The Role of the Patent Model Museum

BY TERRY WESNER

The Patent Office did more than issue patents. According to an 1861 article in Scientific American, it operated the most successful museum in Washington. This museum pre-dated both the Smithsonian Institution and the National Gallery of Art. How did that come about? From 1790 to 1880, every would-be patentee was required to submit written specifications, a set of drawings, and an exact working model of his invention in order to distinguish it clearly from anything similar. The working models were not to exceed 12 inches in any dimension. But sometimes inventors fudged on the size by making the model in several sections.

SOUTH HALL, MUSEUM OF MODELS, PATENT OFFICE.

Fig 1 Photo Courtesy Jim Davie

The Patent Office set aside ample space for a museum with adequate display of the patent models. This quickly became a major tourist attraction, a place of national pride where people from all around the country came to see the marvelous creations of American ingenuity. Since less than 2% of the population possessed a high school education, the Museum of Models provided a place where the public could come and learn how *things* worked.

It also provided the impetus for one exceptional employee to learn how to make *American society* work more effectively. But for the existence of the Museum, the Civil War casualties, and the shrewd judgment of Judge Charles Mason, who is generally believed to have been the most effective Commissioner of Patents in the Nineteenth Century, the American Red Cross might never have come into being!

Here is how it happened. Clara Barton--yes, *that* Clara Barton--left her job teaching school in Massachusetts and went to Washington seeking work. Mason hired her as his confidential clerk at a salary of $1,400. She is thought to be the first woman ever hired to a regular position in the US government with work and wages equal to that of a man. As a "new broom," she stopped some leaks of confidential information in the office and roused some resentment among the male employees. During Judge Mason's temporary absence in 1855 she was fired by the Secretary of the Interior, but on his return, Mason promptly hired her back.

During the Civil War some troops were quartered in the patent office and the north and west wings of the building were used as a hospital. Cots to accommodate 800 patients were placed in the passageways between the glass cases containing the models, so that the examination of the inventions would not be interrupted. Examiners, attorneys, inventors, and the public were free to wander at will among the wounded and dying soldiers, searching for models relating to a particular invention!

When the wounded were brought in from the battle at Antietam, Clara Barton left her duties in the Patent Office to care for them. But she soon concluded that there were plenty of women in Washington to care for the wounded who had made it to the hospitals. That insight was later to revolutionize the care of wounded, sick, and dispossessed people everywhere

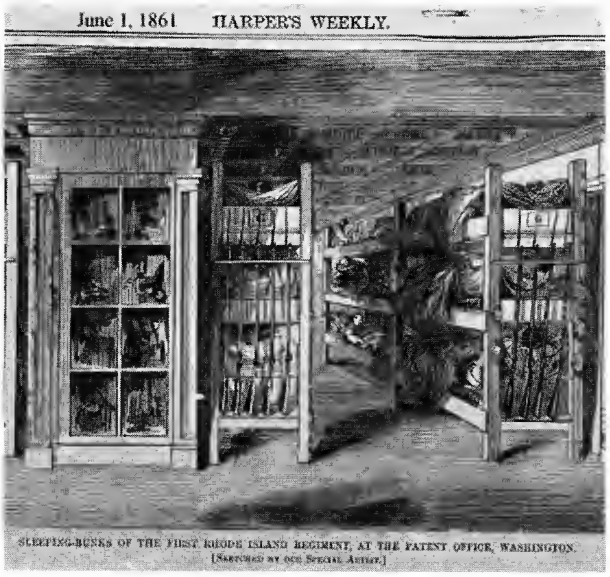


Fig. 2 Photo Courtesy Jim Davie

Appalled by stories of the lack of medical supplies and inadequate treatment of the wounded in the field before they could be transported to hospitals, Clara began advertising in the New England newspapers for provisions for treating them. Soon she was able to establish a distributing agency for the supplies. Later, having gained official permission to go onto the battlefield, she left her job to become a nurse. She was present on 16 battlefields and ministered to wounded men of both sides there. Having discovered her life's work, she founded the American Red Cross after the war was over. What a difference Clara Barton made in world affairs!

With the passage of time the importance of the Model Room continued to decline. Prior to the fire of 1877 it required 15 attendants to allow inspection of the models, but by 1901 that work was done by three attendants. Soon afterwards, the models were moved to rented spaces in the Union building, where they could be visited with some difficulty, but seldom were. In 1908, the models were boxed up and in 1925 the important ones were given to various museums. The rest were sold at public auction. Patent models continue to be sold from time to time, but patent models of scales are very, very rare.

Contemporary Comment (Carved above the entrance to the Department of Commerce)

THE PATENT SYSTEM ADDED THE FUEL OF INTEREST TO THE FIRE OF GENIUS

Abraham Lincoln

References consulted:
Dobyns, Kenneth W. *The Patent Office Pony* ©1994
Jones, Stacey V. *The Patent Office* ©1994
Kursch, Harry. *Inside the U.S. Patent Office* ©1959

Terry Wesner has worked as a biostatistician and a college professor, has authored a successful series of 20 college level mathematics textbooks, and currently owns a publishing company. He enjoys sharing his knowledge and love of learning with larger audiences via the internet. He has a website where you can download entire textbooks for free <totallyfreemath.com> and is just launching a new line of textbooks on CD with video lectures on every page <www.getmath.com>. You can see his patent model collection at <patentmodel.com>. Since he was always the first one to sit down in spelling bees, he also has a website for students with learning disabilities <shortbusstories.com>. Looking ahead, he is currently developing a website on MS <ihavems.com> but it is not up yet.

Model of Daniels' Patent 199,356 Platform Scale

MODEL AND PHOTO COURTESY JIM DAVIE
TEXT AND DRAWING BY D.F. CRAWFORTH-HITCHINS

William Daniels was a very human patentee, but he was not the best writer of specifications! Some careful reading and interpretation of his US Patent 199,356 of Jan 22, 1878 is needed to enjoy the originality of his design. He startcd by thinking about a stylish counter scale with a sleek casing that suggests the 1930s, not the 1870s. The curved corners and the windows on the front and back sides are astonishing for their period. One can imagine the children peering inside as the poises were moved out one at a time. (See Figs. 1 & 2)

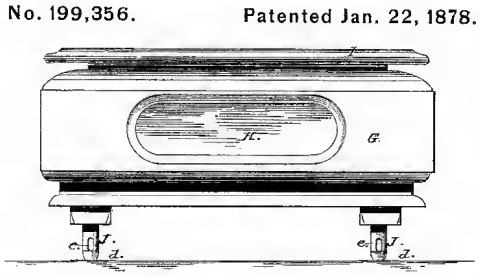


Fig 1 ▲▲ Windows on the front and back sides allow people watch to the mechanism in action.The top Y-beam has been removed and laid atop the case. The model is only 10" long.

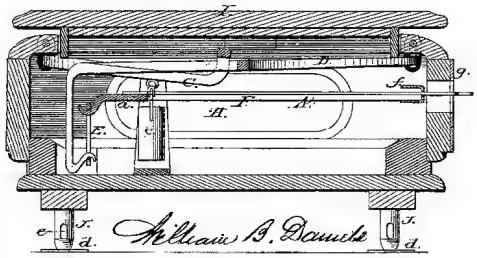


Fig 2 ▲▲ The slides are visible, with the third slide pulled out. The slide has lost its brass frame, which was marked on the datum line to indicate that the load was balanced by the slide.

His counter scale is basically a Y-Y platform scale with a steelyard below the Ys. The steelyard is shaped like a T with prongs (the number of prongs to be decided by the maker) extending from the top bar of the T towards the bottom of the central stalk. (See Figs. 3 & 4)

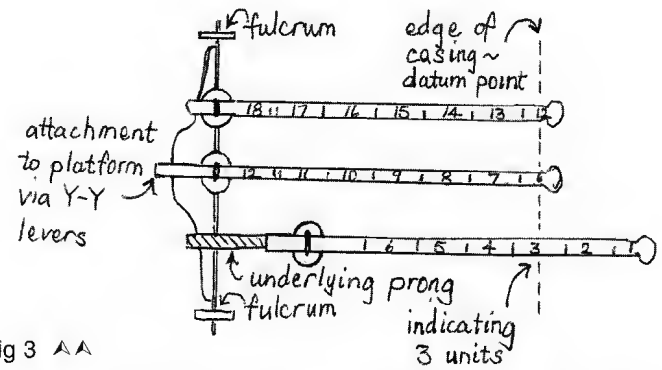


Fig 3 ▲▲

Sketch of modified steelyard. This steelyard forms one piece, working as a rigid steelyard with sliding poises. This version has only three slides, but more could be added during manufacture.

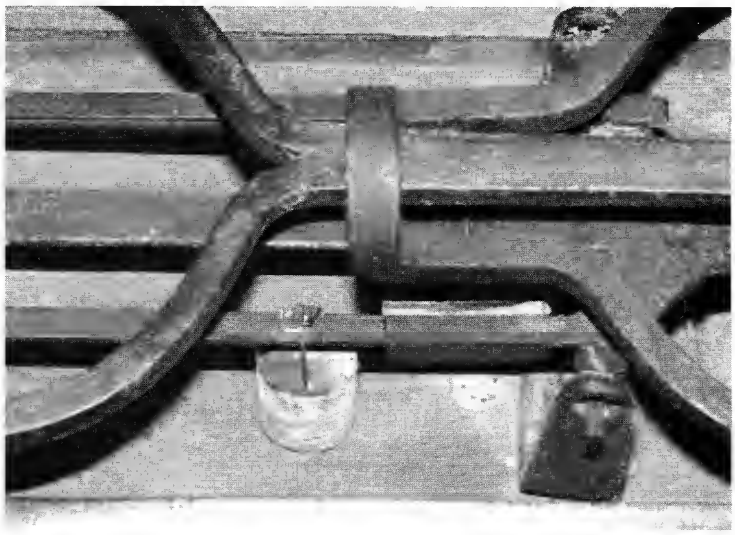
The prongs support sliding strips of metal that have heavy poises attached to their back end. When the load has to be balanced, the strips are pulled manually out of the casing, pulling out the poises attached to the strip. Daniels does not explain how the friction and wear on the basic prongs is minimized. In operation, firstly, the user must check that all the strips are pushed fully into the casing. For a load up to 6lb, the sliding strip nearest the user is pulled out to its maximum. If the load is over 6lb, the next sliding strip is pulled out until the strips "float" in the slot. If the load is over 12lb, then the next strip is pulled out. The user must add up the accumulated graduations to determine the full weight.

Half-way through the patent specification Daniels suddenly refers to wagons and loads of hay! This comes as a surprise on such an elegant scale, but he does describe some of the adaptations necessary towards the end of the text.

The heavy version has several modifications. Heavy metal plates are placed on the ground and the scale is wheeled over the plates. Beams of wood are placed on the scale platform of sufficient length to reach from the front axle to the rear axle of the wagon. The wagon is pushed over the scale. Then the extending legs of the scale can be raised under the wagon to lift the wagon off the ground. (The legs have screws inside them.

This seems to be a case of over-enthusiasm by the patentee, wanting to have more than one application for his brilliant idea. If Daniels had restricted himself to his counter scale, all would be straight-forward and practical. By wanting a huge version, Daniels over-reached himself.

Fig 4 ➤➤



The Y levers sit neatly over the steelyard. The lead poise for the nearest slide shows clearly. Daniels recommends using heavier poises for greater loads. On this model, the support for the fulcrum has been bent slightly at some time during the last 120 years, but a real scale would have been built with a stronger fitting and would never have been built with a stronger fitting and would never have bent.

Model of Usher's Compensating Poise for Scale Beams

MODEL AND PHOTOS COURTESY WILLIAM DONIGER
TEXT BY D.F. CRAWFORTH-HITCHINS and WILLIAM BERNING

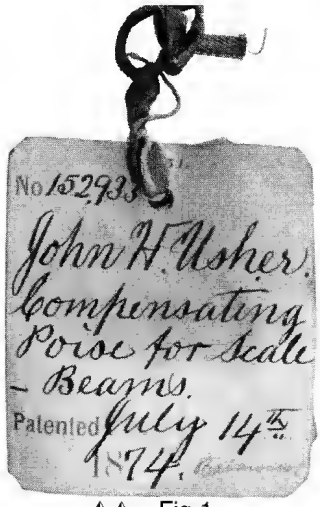


Fig 1

Patent no. 152,933 is concerned only with the ball screw that moves along the screw-threaded bar--rather a neat adustment system. The whole bar can be moved left or right by loosening the 2 screws, or up and down the side slots by loosening the tiny screws in the end of the bar. A very small adjustment up or down is sufficient to make a beam rock more accurately as you are changing its "fastness" (the mass of the beam is fractionally raised if the ball is raised up its slots, so the beam tips to one side more emphatically and wants to stay there). Scale men prefer the lower ball position as it's more accurate, but scale users prefer the higher ball position as it makes the scale easier to use. The patent gives no reason or explanation as to why this could be used. It suggests that it could be added to any scale beam for minute adjustments.

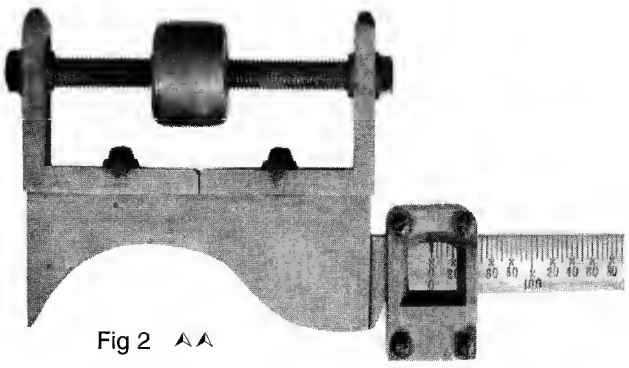


Fig 2 ⋏⋏

Oh Rube Goldberg, Where Are You Now?

BY JEROME R. KATZ

I've long ago come to accept what contraptions man can, will and does conceive to accomplish the simple job of weighing.

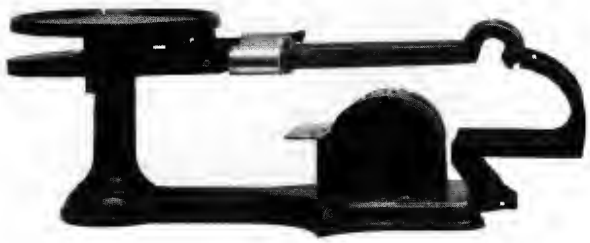


Fig. 1

Patent no. 279,864 was issued to William Farnum of Hoosick Falls, NY, on Jun. 19, 1883, and 1/4 was assigned to Elisha S. Peck also from Hoosick Falls. Farnum's actual patent shows the cradle for the weights attached to a roberval scale, but the scale shone in the photo above is a double beam steelyard counter scale. See EQM pg. 2412 .

Case in point ---- I've come across an otherwise ordinary double beam steelyard balance counter shop scale, but that's only half of it. I will not discuss here the double beam steelyard with sliding poises; it is of conventional type. I will describe the add-on weights, their storage and their use, not necessarily in that order.

With a claim to facilitate the storage and use of add-on weights, our inventor conceived of a cradle hung on knife edge bearings from the end of the double beam and tied back into the underside of the base with a rod implemented much like the stay of a Roberval balance.

The cradle is constructed of six compartments, although the patent is general enough to apply to any number and size of weights. In this case the six weights are iron discs, with the two smallest ones, the 1/4lb and 1/2lb , being annular shaped (donuts). The weights are also numbered 1, 2, 4, 8, 8, and 10 which seems to be an arbitrary assignment.

In steady state situation the weights are stored in a six-compartment rack built into the scale's base that is the exact counterpart of the cradle, with like compartments aligned in the same plane . When the weights are all stored in the base rack, the scale is in equilibrium. When additional weights are called for, the desired weight is rolled like a wheel from its compartment in the storage rack into the corresponding compartment of the cradle. Clever. Neat. No searching for the proper loose weight lying around on the counter. Just simply touch the desired weight and roll it into the cradle without disturbing others.

Fig. 2

This view shows the cradle onto which the weights are rolled and the stay under the scale that supports the cradle and attaches to the goods plate. The cradle is attached to the scale's beams with knife edges and receives the weight when a load is applied. The manufacturer of this scale is unknown.

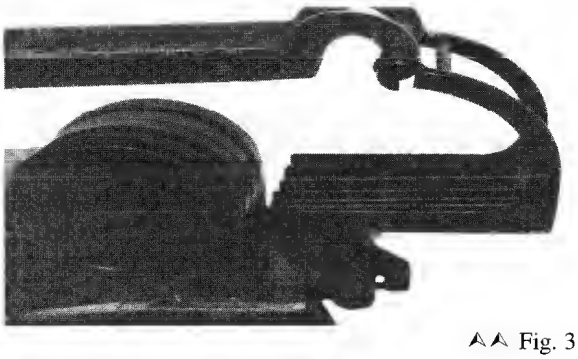


Fig. 3

This view shows the rack with the weights in place when the scale is in steady state. Farnum's patent with its weight containment system *improves the annoying inconvenience resulting from having a number of loose weights lying around to get lost !*

The design and implementation of the cradle in the scale that I found is somewhat different from the patent--a manufacturing change introduced either immediately at first production or some other time. Although no maker's name or mark is evident on my scale. a brass plaque affixed to the weight storage rack carries the weight-size numbers and the patent date of June 19, 1883. My scale measures 22in by 9 in by 9 in.

Fig 4. The brass plate showing the patent date and the denominations of the proportional weights. The patent corresponding to the date on the plate is no. 297,864.

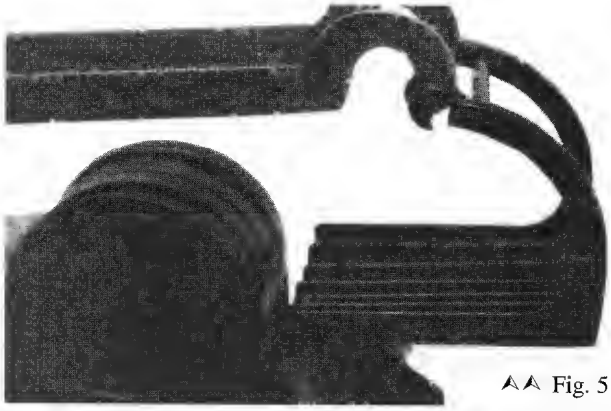


Fig. 5

The rack that holds the weights when the scale is in steady state and the alignment with the cradle into which the weights are rolled as the load is applied to the goods plate. Each weight can be rolled into the cradle without disturbing the others. Any balance scale could be manufactured in this modified form to use the system of rolling weights.

The iron weights for the Farnum patent sale are proportional so that the 1/4 lb weight will balance a 1lb load.This means that the proportion is one to four. Farnum states in the patent that the weights may be made all of one diameter, as are these, and relative differences in their gravity can be secured by varying their thickness and removing the center. The 1/4 and 1/2 pound weights are annular shaped and the disk shaped weights vary in thickness

Fig. 6

The patentee was a William C. Farnum of Rensselear County, NY.
Curious point: the also clever Micrometer scale was born in that county.
I wonder if Rube Goldberg was born there as well.

References: EQM 1992 No. 1, pgs 1537-1532824-28248; EQM 1999 No. 4, pgs 2412-2414.

Animal Shaped Weights of the Burmese Empires

The weights were made in four shapes: a mythical feline beast (to); an anserine, gooselike bird (hintha); a gallinaceous, chicken-like bird; and an elephant (chang). Throughout Asia, birds were associated with heaven, light, water, and the gods. Large felines were associated with the earth, darkness, and kings. The first three shapes were used throughout the empires; elephants were used only in North Siam. Since the weight shapes fall into a sequence, they can be classified and assigned to periods (reigns) and places (capital cities).

References: Gear and Gear. *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures.* 1997; EQM 1993 No. 1, 1662-1663.

Beginners' Guide Part 8

Spring Balances

Beam	None
Resistant	Spring
Fulcrum	None
Load	Centred below or above spring
Stabilised by	Hook or pan below spring or top pan with roberval linkage
Graduations for equal units	Equally spaced on graduated plate
Common names	Pocket steelyard, Circular or Dial spring balance, Flat-face spring balance, Tubular or round spring balance, Mancur, V spring, C spring, Hide scale, Gypsy scale, Romaines à cadran.

As with so many words used in this subject, "balance" is inappropriate. Springs were fixed at one end and all movement took place to one side of that fixing, so no balancing occurred! But tradition supersedes reality, and so "balance" is used throughout Part 8 for the object using a spring as the resistant.

All spring balances relied on the distortion of the metal, quartz or glass to indicate the weight of the load. Springs distorted evenly along their length, so a helical spring stretched a little bit along every part of itself, not more at one end than the other.

As a generalisation, the longer the spring the more accurate was the reading. So a short flexure (flat ribbon) spring was unlikely to be as accurate as a helical spring that had a long piece of metal curled up into a small space. But the tensile strength of springs varied enormously, depending on the material used and the thickness as well as the length.

Springs indicated weight whether the ends were pulled away from each other (tension), or the ends were pushed towards each other (compression). The use of compression was much less common than the use of tension, so presumably tension springs were more accurate and easier to make consistently.

The maker needed only a means of attaching the load to the spring, and a pointer moving in front of a graduated plate, and the balance was adequate. (Fig. 1, US pat 35125.) Casings were devised to protect the spring, and as Weights and Measures inspectors became more particular, casings became compulsory in many countries. The USA was more relaxed about the necessity for casings than other industrialised countries; as usual, they credited the user and the customer with intelligence, and did not "nanny" the customer.

Most spring balances were relatively imprecise. In the UK 1906 Regulations concerning trade use, they had only to be as accurate as counter machines (that had linkages under the pans) and were not tested for sensitiveness. The load had to be indicated towards the middle of the range shown (for example, it was not permitted to weigh a 99lb load on a 100lb-capacity spring balance) and the spring had to return to its resting position in a short time. Although spring balances were permitted in the UK, there were countries that banned their use in trade, or that permitted only one or two reputable companies to supply traders.

The imprecision of spring balances was ignored by private users, who wished merely for a fast read-out on a small weighing device. Weighing letters, fish ,(See Figs. 2, 3, 4), luggage, eggs, and suchlike objects in the home was very adequately handled by a cheap spring balance kept in a drawer.

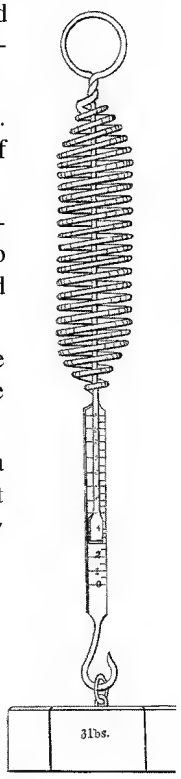


Fig. 1. ⮝⮝ Single wire coiled round, the simplest form of spring balance. Laurence's US patent of April 1862, no. 35125.

Fig. 2. ➢➢ One of many spring balances hidden in a tool that fulfils some other function. This is a Fisherman's pride, made in Germany, and "Not Legal for Trade".

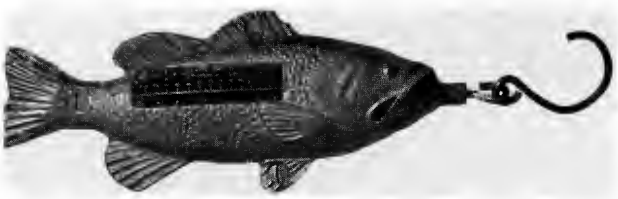


Fig. 3. ⮜⮜ An American decorative fisherman's balance made of aluminium, mid-20th century.

Fig. 5. ➢➢ V spring drawn by Diderot for his *Encyclopedie* of 1755. The same design was still being made at least 60 years later. The capacity of V springs was small. 5 kilos was normal (once kilos were adopted as the unit of measurement.)

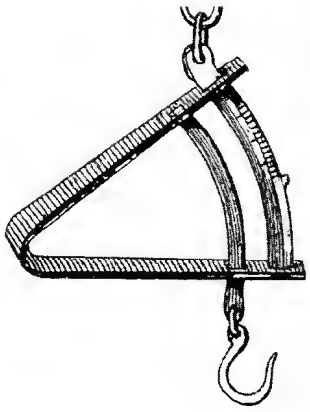
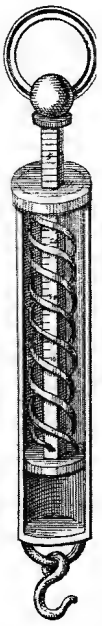


Fig. 4. ➢➢ A strong helical spring provides the resistant in this sack balance drawn by Leupold in 1726.



History

Metal springs were used in clocks and locks for well over 300 years before their use was applied to weighing. They were used for crossbows and guns, then for coaches by about 1650. Robert Hooke, the famous scientist, wrote on the expansion of metals in 1678, and published drawings of simple spring balances in his papers. Weigel describes (in German) spring balances in *Abbildung der gemeinnützlichen haupt Stände* in 1698 as "scales, newly invented, made from steel, working without pans and weights, by a wire spring". Bion referred to spring balances in *Traité de la construction et des principaux usages des instruments mathematiques*, in 1709. Leupold shows only one in *Theatrum Staticum* in 1726, a compression spring balance for weighing sacks. (See Fig. 4) Diderot showed a flexure V spring balance in his *Encyclopaedie* of 1763. (See Fig. 5)

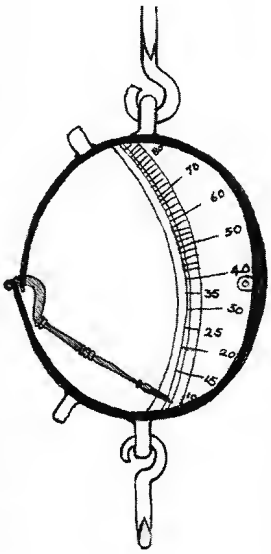


Fig. 6. ⮜⮜ A spring balance, with fittings for two weighing positions and two holding positions. Made for the Duke of Cumberland, an Englishman who died in 1765. Graduated 10-90[lbs] on the light side and 50-322[lbs] on the heavy side. SM no. 1927-1150.

As the earliest spring balances' manufacture cannot be pin-pointed, it may be more sensible to look for the first surviving examples. Mancurs were made from the mid-18th century in Germany, with variations of the C-spring following within a few years. Salter is said to have started making "pocket steelyards" using compression helical springs in the 1760s in the UK. A few mancurs (made with a C spring) were dated, as was M Böelle's 1786 example, but most surviving examples have to be dated by the working dates of the maker. Hanins' beautiful cut-away dials date from their living in St. Romaine in France before 1785, and show the international scope of their thinking. Pauly's UK patent of 1816 was still using flexure springs, (see Fig. 7) as was Braby for his huge C spring balance a few years later. The first US patent for a spring scale was not until 1844, by

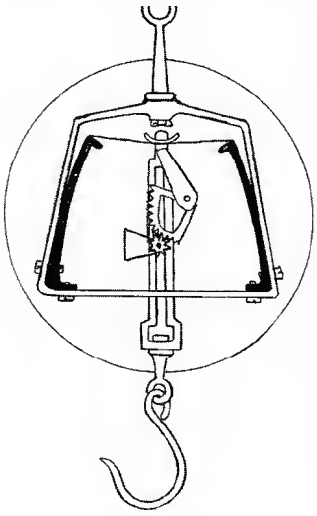


Fig. 7. ⮜⮜ Two flexure springs were pulled by the top band towards each other when a load was hung below the top band. Rack & pinion to pointer. Pauly's UK patent of 1816.

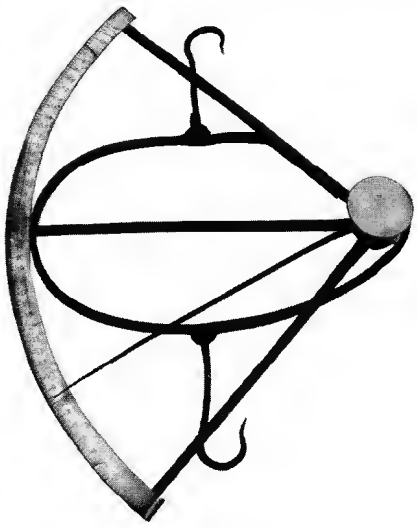


Fig. 8. ➢➢ Coach springs were used by Braby as the resistant. The coach spring was pulled open by the load, and the lower tip of the spring pulled the back end of the pointer so that the front tip of the pointer rose.

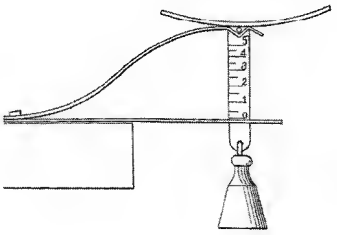


Fig. 9. ⋏⋏ This elegant little postal with its flexure spring was patented in the USA in 1867 by Cox, no. 69774. This design, with a lump keeping the graduated plate hanging vertically, circumvented the problem of so many flexure spring balances, that of having the tip of the spring curving down as the load descended, and eventually having the load fall off.

Fig. 10. ≺≺ Exceptionally large C spring mancur by P Dumaine, overall 21ins (220mm) high. The smaller one is conventional, being 5½ins (110mm) high. The Dumaine is one sided, with only one support ring and one load hook The smaller one is two-sided, with two support rings and two load hooks. Even smaller examples are known, only 3½ins high, but with strong C springs to provide a capacity of 30 kilos.

Fig. 11. ≻≻. This anonymous C spring is pulled open by the load and the spring itself forms the indicator. Courtesy R Willard

J H & R K Bull, but it was a usful combination of lever and spring to increase the capacity of the spring, with an extra pointer to indicate subsequent rotations of the main pointer.

The Americans were very much later in trusting spring balances than were Europeans. This is clearly indicated by their Patent Lists. Between 1829 and 1859 only four patents for spring balances were obtained, then between 1860 and 1870 thirty-two were obtained. Even then, very few of them were for trade purposes, many being for "non-critical" products such as postage, beer or hay. (Fig. 25.) Mancurs were more-or-less obsolete in Europe by the third quarter of the 19th century, but were still being exported in huge numbers to the USA.

A few companies specialised in making spring balances, such as Salter and Siebe/Marriott in the UK, J Chatillon & Sons (having started as makers of beam scales, they rapidly became specialists in making spring balances), Triner and Morton & Bremner in USA, Ubrig in Germany, but many more companies offered them for sale under their own name; for example, Salter and Louis Hirschberg, Salter and Alex Bernstein & Co, Salter and W & T Avery. The makers of spring balances were prepared to stamp on any name requested, and often omitted their own name. (See Fig. 35.)

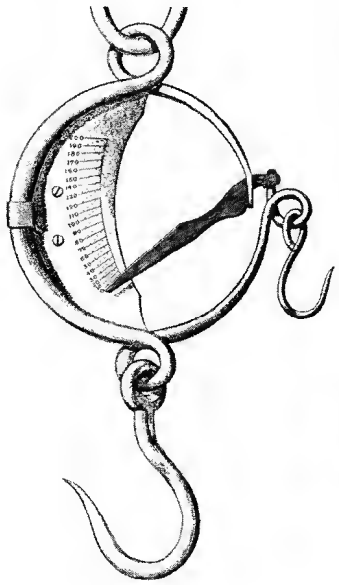
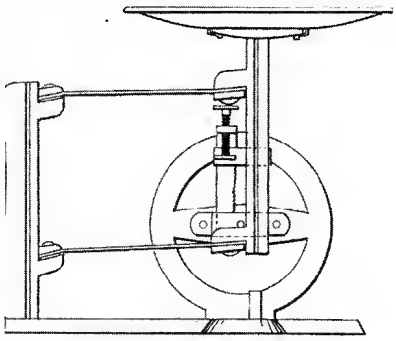


Fig. 12. ≺≺ Mancur with the spring curled to form the little loops as well as the main C. Two load hooks but only one support ring, so the light capacity is not as low as if an extra support ring had been positioned nearer the end of the C spring. Salter catalogue 1893, showing their mancur with the Design Registration no. 6575 of 1882.

Fig. 13. ≻≻ Shaler used a helical spring in his household scale US patent 51226 of 1865, but he patented this flexure spring version no. 66524 in 1867. Was it made?



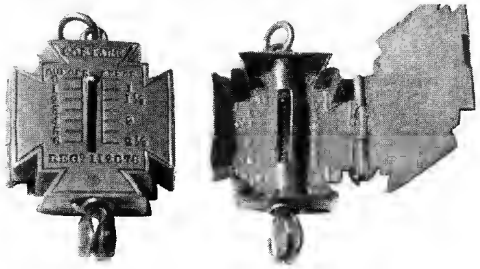


Fig. 14. ≺≺ Even the tiniest springs were adequate for letter-weighing. This postal scale is only big enough to take a stamp, but it could check a letter of 6oz (rates used up to 1897). Design Registration no. 112078 of 1888. Sold in brass, nickelled and gilt versions.

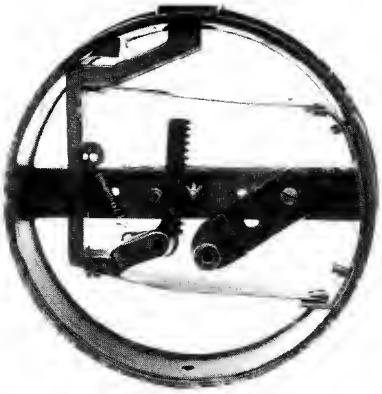


Fig. 15. ⅄⅄ The mechanism inside an Ubrig household scale, a variant of English patent no. 6586 of 1885. The flexure springs are a primitive sort of linkage.

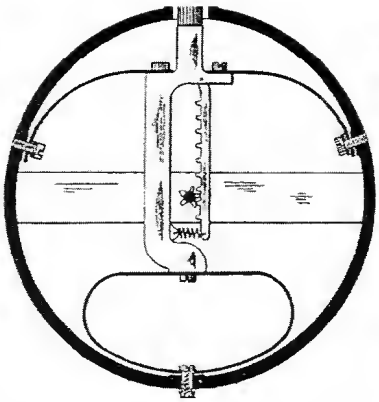


Fig. 16. ⅄⅄ This design of flexure spring, being symetrical, and not swinging in an arc (as in Fig. 15), should have been commercially successful. Ubrig's English patent no. 6586 of 1885.

Fig. 17. Curling the spring round in a C fits the flexure spring into a smaller space. Hanin of Romain in France seems to have been the first maker, in about 1780, to add a rack and pinion to turn the pointer round the dial. This back-view shows the C spring clearly.

Courtesy J Berning

Flat flexure springs

These simple ribbon-like springs bent only slightly, as too great a bend either allowed the load to drop off the balance, or prevented the pointer from reading off the graduated plate accurately. See the discussion under Fig. 9. This problem was circumvented by increasing the length of the "ribbon" and curling it round into a C, a V, or an ellipse, producing the delightful variations of mancurs.

C spring & variations

The advantage of C spring balances was the ease with which an extra load hook or suspension hook could be attached to the spring, to enable the force that opened the C to vary. If the attachments were near the ends of the C, the force needed to open the spring was not great. If the attachments were near the centre line of the C, a much greater force was needed to open the C. So one mancur could have a capacity of say 30 kilos on one side (using the hooks near the ends) and a capacity of 300 kilos on the other side (using the hooks near the centre line). (See Fig. 12) But not all C springs had extra load hooks or support rings. (See Fig. 10)

Two flexure springs with casings

Stability for a top-pan household balance could be achieved by fixing to the outer casing flexure springs in parallel positions somewhat in the manner of a roberval linkage, but using the flexure to register the drop produced by the load. (See Fig. 13 & Fig. 15)

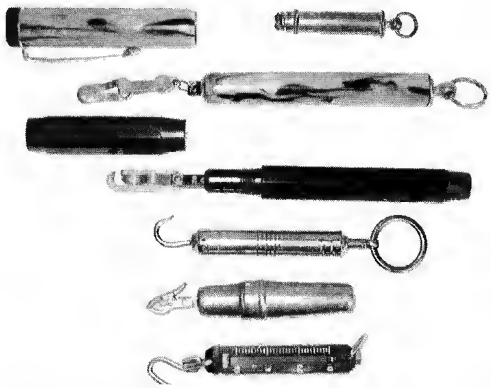


Fig. 18. ⅄⅄ Further examples of tiny spring postals, inserted in pen-type cases, all 20th century. The fourth one down has a very sharp hook, suggesting that it would be suitable for fishermen in UK weighing very small fish.

Helical springs

These were divided into those that contained compression springs with the ends pushing towards each other, and tension springs that stretched when the load was applied. Most candlestick postals had compression springs but occasionally one turns up that has the slot in the bottom half of the tube with the spring being stretched in use (tension). Although candlestick postals have a top pan, they are not held vertical by a half-roberval linkage, but merely by the rod

Fig. 19. ⅄⅄ Brass candlestick postal, with iron base.

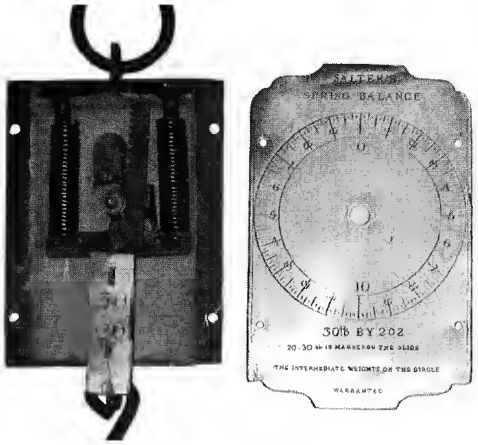


Fig. 20. ≺≺ One spring is suspended each side of the ratchet that turns the pointer. Capacity 30lb. (20lb on the dial and 0-30lb on the slide.)

Fig. 21. ➢➢ Two springs are suspended each side of the ratchet that turns the pointer. Capacity 60lb (30lb on the dial and 0-60lb on the slide.)

below the pan moving through a narrow gap or between rollers. This is adequate for very light loads, but a heavier load would put lateral forces on the rod and cause a lot of friction between the rod and the narrow gap. (Fig. 2 & Fig. 3, Fig. 14 & Fig. 19.)

Multiple springs

To increase capacity, two or more springs worked in parallel. Siebe/Marriott used two or three ellipses tucked inside the outer ellipse, (see Fig. 22) and many companies used helical springs in a row, all being pulled by one load hook.

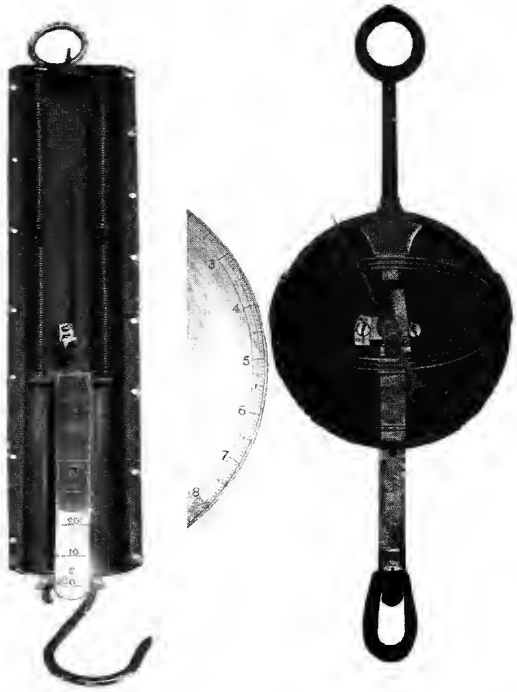
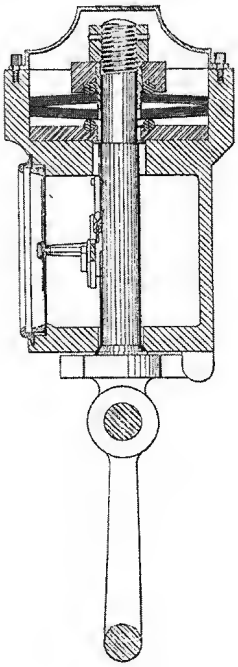


Fig. 22. ⅄⅄ The elliptical springs were used single, double, or triple. This triple example has a capacity of 20 stone, (280lb) and is made as Siebe made them in the 1820s, although it was made by Pooley after about 1860.

Disc springs in crane weighers

The distortion of a disc, when pulled in its centre, was very slight compared with the distortion of a ribbon or wire spring. This was useful for extremely heavy loads, as weighed by a crane, allowing for a very compact weigher. The read-out sometimes became visible to the naked eye by getting the disc to force fluid through a narrow pipe and thus elongate the read-out.



Bifurcated pointer

With spring balances that had two load positions, and thus two sets of graduations, two sides of the graduated plate were utilised and the pointer was required to indicate the weight on both sides of the plate. The pointer was consequently bifurcated.

Levered or rack & pinion pointer

Spring balances operated directly by having a pointer attached to one end of the spring, and moving direetly over a graduated plate. To increase the distance between the markings, a long pointer

Fig. 23. ≺≺ The springs are shown in plain grey. They are circular domed discs that were compressed when a load of up to 5 tons was applied. The movement was transmitted via cams to a rotating pointer. Made by Salter, given UK Board of Trade approval in 1911.

Fig. 24. ➢➢ The helical spring inside the tube is attached to the back end of the pointer, so that the pointer moves over the arc. Made by E Ubrig of Germany for the UK market. Postal rates for 1897-1915.

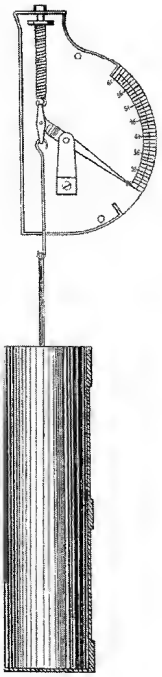
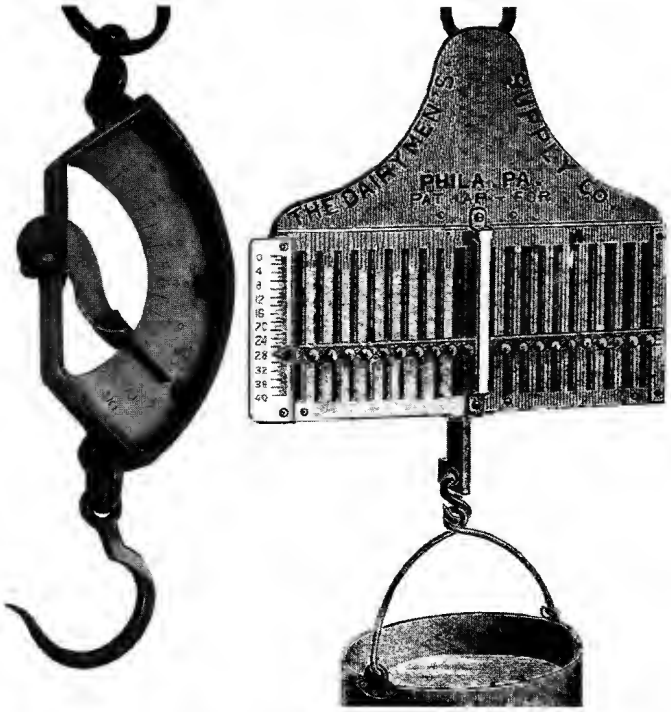


Fig. 25. ⋖⋖ The back of the pointer is moved by the action of the load pulling down the helical spring. Martin's pocket grain scale, US patent no. 73356 of 1868.

Fig. 26. ➢➢ The pointer is bifurcated, and has a well-cast triangular-section going to each side of the brass graduated arc. But there is only one support ring, and only one load hook, so only one set of graduations is needed. However, Le Boucher graduated both sides of the brass, 1 - 65 kilos. c.1785.

Fig. 27. ➢➢ Far right. The pointer is very elongated, so that 20 punch-buttons can be accommodated across the width of the card. The Dairyman's Supply Co. made this milk scale in 1903.



could be levered using the two ends of a C spring against each other. To increase the distance between the markings with a helical spring, the end of the spring was attached to a rack that was pressed against a pinion (cog) that rotated the pointer round a circular dial. The larger the dial, the larger could be the interstices between the markings. A rare variation by Emil Ubrig had a lever offset on a candlestick scale, so that the pointer moved over a graduated arc much longer than the plate down the front of most candlestick postals. (See Fig. 24, Fig. 25)

Fig. 28 ⋏⋏ Half roberval linkage with spring resistant. This little bow-front is only 3 1/2 ins high but claims to weigh a parcel of 1lb. On checking, it proved to be very inaccurate, reading 15 oz when 12oz was put on the pan! Even though the spring is very near the attachments of the half-roberval links to the casing, the bottom of the spring still moves through an arc as the pointer descends. Made by Setton & Durwood of Birmingham in the 1930s. Bakelite base.

Fig. 29. ➢➢ J H & R H Bull of New York were ahead of their time. They patented a platform scale with a spring resistant, with one dial for whole revolutions, and one for part revolutions in 1844.

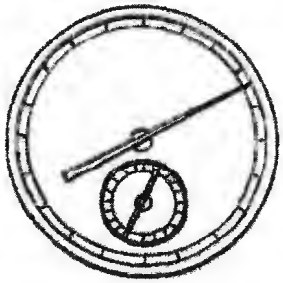
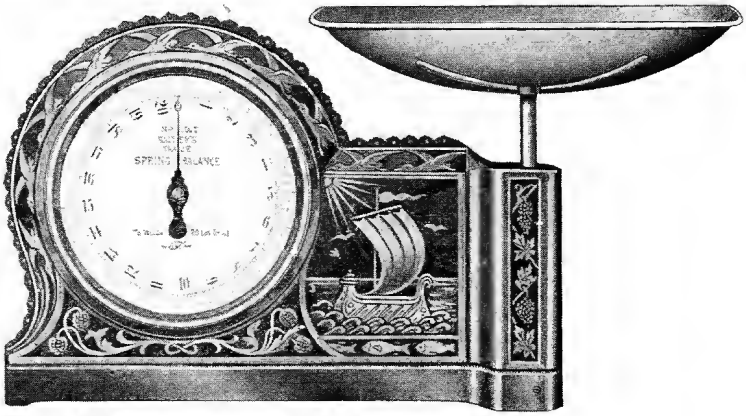


Fig. 30. ⋎⋎ Half-roberval and spring counter scale for butchers, fishmongers & greengrocers, Salter catalogue of 1920. No example known.



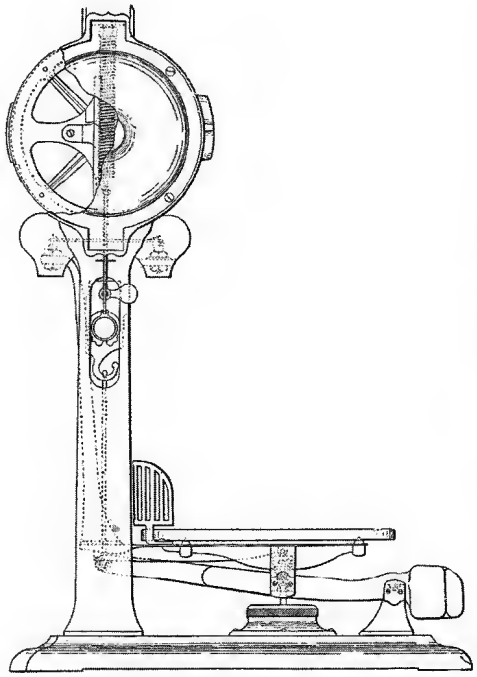


Fig. 31. ≺≺ Between the spring and the load hook rod a "thermostat" is mounted. This is to compensate for the variation in torsional rigidity. If the scale gets hot, the spring stretches a bit, while cold causes the spring to become more rigid and consequently not stretch as much as usual. To avoid this erratic stretching, a device is added that uses the difference between the expansion of different metals to counteract the stretching of the spring. The Computing Scale Co, of Dayton, OH, took out this patent in 1920 at a time when the British makers ignored the problem. This could be due to the moderate climatic conditions in UK, as compared with those of the USA.

Fig. 32. ⩚⩚ Half-roberval with the upper linkage attached to the casing in the "nose" protruding backwards, and the lower linkage under the base. Salter 11D, for diabetics. The aluminium scale fits into an American cloth-covered case for carrying out of the house, so that carbohydrates could be weighed at table. c.1926.

Top-pan half-robervals

To put a pan on top of a spring needed some form of linkage to hold the pan's rod vertical, usually a half-roberval linkage. Whether the linkage was behind the spring, as on so many bow-fronts, at the side or in front of the spring was not significant. (Fig. 28, Fig. 30 & Fig. 31.)

Dial and slide

These spring balances appeared to have two systems to operate them, but the slide was merely recording how many times the pointer had rotated round the dial. Thus, the dial might indicate 4lb on one rotation, so for a load of 9lb, the slide indicated 8lb as the pointer had rotated twice, and the pointer recorded 1lb. The slide either dropped below the dial, or it showed behind a window on the dial. (See Figs. 20 & 21.) Some examples have a second dial on the face of the main dial, recording the extra rotations. (Fig. 29.) Some American postal scales recorded the change in postal rates rather than the weight change.

Platform scales with spring dial head

The combination of a set of levers beneath a platform scale, with a spring balance in the head of a lollipop, meant that the spring was only dealing with a part of the full load, but was giving the user an easy read-out on the dial. (See Fig. 31.)

Compensation for temperature in price-computing scales

Although the British ignored the relaxation of the spring in hot weather, the Americans, in the 1910s and 1920s, tried to compensate for the lengthening. See the comment with Fig. 31. Some companies used compensation bars in the lever holding the goods plate. By putting the compensation at that point, the price-computing remained accurate throughout the range of the chart. However, the Computing Scale Co.

Fig. 33. ➢➢ A taring method that was simple to make, but needed a clear head to use! To adjust the balance for a bucket, the left-hand graduated plate was slid down its grooves until the zero mark was opposite the pointer. The bucket was then removed Then the right-hand graduated plate was slid down till the two zeroes were opposite. The load and the bucket were then put on the hook and the pointer descended to show the net weight of the load. If the gross weight was desired, the weight was read off on the right-hand slide. The left-hand slide was moved down until the zero was opposite the indicated weight. Then any required quantity could be removed so that the pointer rose and pointed on the left-hand slide to the amount taken out Patented by Snyder of Lakeville, CT, in 1865.

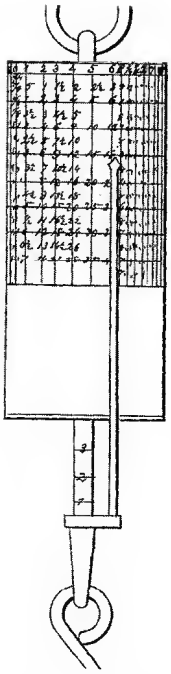


Fig. 34. ≺≺ A sleeve with prices per pound was wrapped round the tube containing the spring balance. The weight was registered on the rod descending below the tube. The price was determined by twisting the vertical pointer until it lined up with the desired price per pound (along the top line of the chart) , then the load was put on the hook, which pulled down the rod with the weight marked on it, and also pulled down the vertical pointer. The tip of the pointer was then at the price of the load. Beckwith's US pat 12249 of 1855.

Fig. 35. ➢➢ Density balance by Salter, Birmingham, made for West's of Manchester. Graduated for 0 -1.0 over the 1st quarter of the dial, without divisions, then 1.0 to 4.0 over the other 3 quarters by .2 divisions. The pointer has two adjusting screws. One of many special balances made, often by special request, by manufacturers of standard balances. Mid-20th century.

used exceptionally long springs so their extension was multiplied through the rack and pinion and the indicating drum. So the stretching of the springs in hot conditions was made more pronounced by the mechanism. But the steel rod used to counteract the stretched spring only started to compensate after the load was applied, so the machine was not reading at zero in hot conditions. Thus the machine had to be re-balanced whenever there was a change in temperature.

Small & large springs working in tandem

To allow for greater accuracy in weighing small letters, one maker put the load hook on a light spring, so the pointer read off small loads with large divisions between each unit, then, when a heavier load was attached, the light spring engaged the end of a heavier spring, and as the pointer descended further, the units were indicated less precisely.

Taring

Adjusting the position of the pointer was achieved by moving the pointer along the spring a little way, using a tare screw attached to the outer casing. This, in effect, shortened the spring very slightly. Alternatively the graduated plate could be moved relative to the pointer. (Fig. 33)

Patents

Few spring balances were patented, as there was little of originality about spring balances. It was usually only additions that gave an opening for protection, such as extra pointers or levers (Bull's US patent 3752, Moore's US patent no. 3396, Turnbull's US patent 25473), sleeve with prices, (Fig. 34), and sliding graduated plates (Fig. 33).

Dynanometer & spring balance

Alexanderwerk made a simple addition to their person scale. They put four handles on the side that, when squeezed, compressed the springs inside and indicated the force that a person with strong hands could exert. Elliptical spring balances were also adapted to this use. Ubrig mounted a stalk with handles at thigh-height on the platform, so that strong men could heave on the handles and push their feet down, registering their pull on the dial beyond their own weight.

Other purposes

Spring balances can have a second pointer that stops at the position where most force is applied, so they were used to indicate pressure, steam pressure in steam engines, tension on wires (as for example, between electricity pylons), the force needed to get a trigger to trip (say, on a Lewis gun), the snapping point of yarn, etc. They also made balances that read out in units that are not weight-units. (See Fig. 35.)

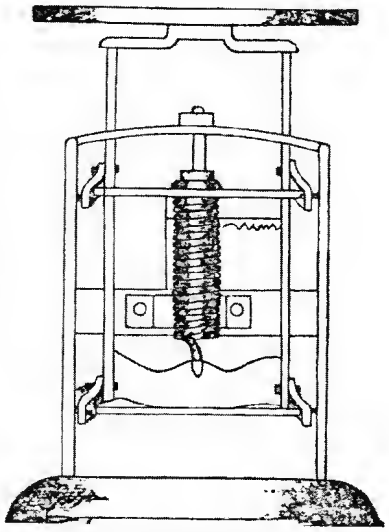


Fig. 36. ⩓⩓ An alternative to using a half-roberval linkage was to have vertical rods sliding through tubes or holes. This was intended to keep the load-pan horizontal. Several companies made a version of this principle but all tested have been very inefficient, due to the rods rubbing in their tubes. This example by P Falardo was granted UK provisional protection in 1869.

My Magic Scale

BY ROBERT FOSTER

Fig.1

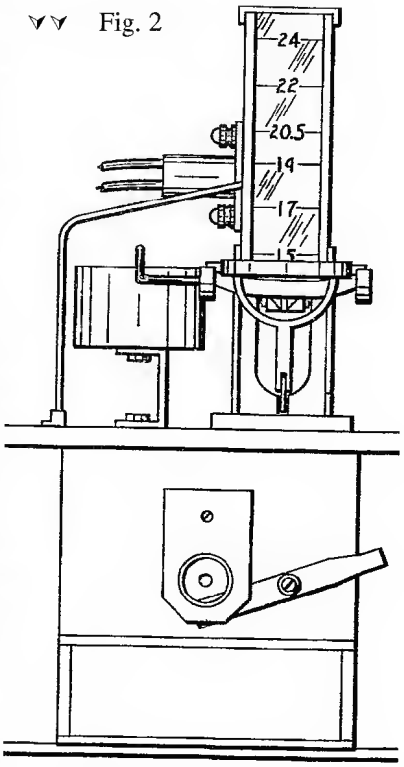
I found it at the Antique Tractor Show and very nearly left it there. When I first saw the scale it was so crummy looking. Oil from the damper had collected years of dust and grime along with the remains of broken eggs. But after walking around for an hour and thinking about it, I brought it home. I am glad I did. After a good cleaning I found it to be in excellent condition and working order. I like scales that are different or unusual in design, and this one certainly is.

The egg scale has the words "Magic Scale" on the ring where you place the egg to weigh it. A decal front and center reads

SHAD-O-LITE
GRADER AND CANDLER
NATIONAL POULTRY EQUIPMENT CO. SEATTLE
PAT # 2,165,423 - 2,27?,591

The first patent, no. 2,165,423 was issued in 1939 and looks to be an early version of this scale. But thc decal was worn, and I mistakenly read the second patent listed there as no. 2,271,591, which isn't for an egg grader at all; it's for a power rake! Jan Berning later supplied the correct patent, no. 2,273,591, as shown in Figs. 2 and 3.

Fig. 2



J.E. Powell assigned Patent no. 2,273,591, dated Feb 17, 1942, to the National Poultry Equipment Co. of Seattle, WN.

The unit is 12 1/4in high, 11in long, 6 1/2in widc. The finish is black enamel. (See Fig. 1) It operates on 120 U.A.C. and has a transformer to reduce to 6V for the two light bulbs. The light bulb in the lower box has a chrome plated reflector to direct the light to a hole in the end of the box. A flat piece of phenolic material is riveted to the box with a matching concave hole to hold the egg against to candle it. Below the light and reflector is a frosted glass that lets out enough light to look over the outside of the egg. The upper light box is a frosted glass window, sometimes marked with five divisions down the front showing the egg weights or sizes. (See Fig. 2) On my scale, the window is not marked.

When an egg is placed in the ring, a piece of sheet metal hooked to the back end of the beam rises in front of the light, casting a shadow on the window corresponding to the weight of the egg. On the bottom of this sheet metal strip is an adjustable weight to balance the scale. An arm attached to the beam above the fulcrum goes to an aluminum oil damper that has a snugly fitting cover. (See Fig. 3)

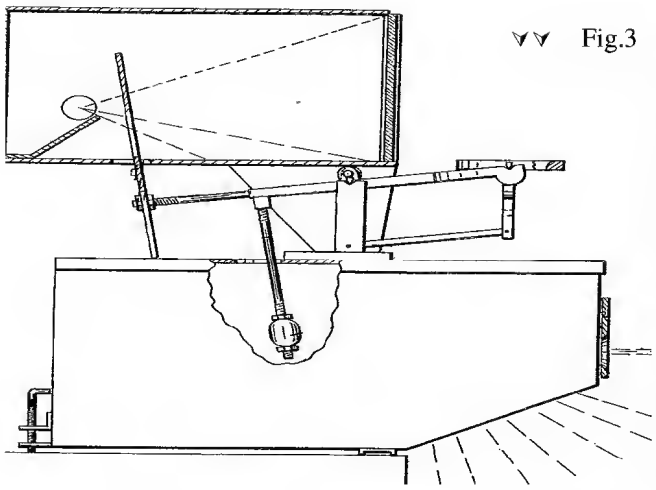


Fig.3

Grading generally involves the sorting of products acording to quality, size, weight, and other relevant factors. Eggs are candled by holding to the light and examining the interior of the egg According to the *Egg Grading Manual*,[2] the air cell normally at the large end of the egg grows larger as the egg ages. When first laid there is no air cell, and gauges are available to measure its size. The characteristics of the yolk are determined by the shadow that it casts on the shell before the candlelight. The quality is judged by the position of the yolk, distinctness of the yolk shadow, size, shape, defects, and germ development. The yolk should be centered in the egg and hold its position when twirled. The chalazae are spring-like and hold the yolk in position, and if deteriorated the yolk will move freely in the shell. Blemishes, germ development, and spots may be observed which lower the grade of the egg. Significant training is necessary for expert grading of eggs. (See Fig. 4)

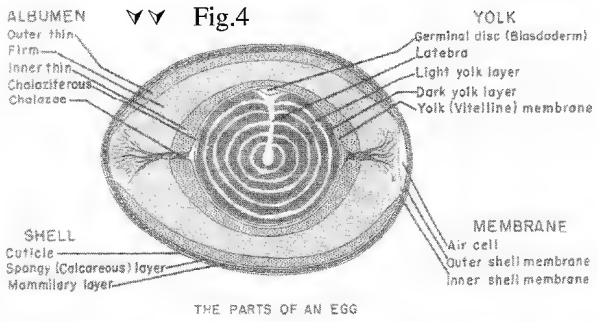


Fig.4 THE PARTS OF AN EGG

Founded in Washington state in 1935, the National Poultry Equipment Company is a privately owned customized manufacturer of egg processing equipment for small and medium sized poultry breeders and egg producers. Their first product, the Magic Egg Cleaner, cleaned the eggs with a series of sanding loops that buffeted the egg as it was carried through the machine on the conveyer belt. Their second product, the Aquamagic, employed a system of nylon brushes and a water-based cleaning solution and added a grader, making it the first egg processor that candled, sanitized, and graded eggs in one step. In 1984 Cal-Mar Industries purchased the company and moved it to Modesto, CA. There, they expanded the market for the machine to include all avian species, not just chickens. The machine is now used for turkey, duck, goose, and pheasant eggs as well as for the SPF egg industry that supplies the biological and pharmaceutical industries for avian and human vaccine production. In June, 2000, Barlar Industries bought the company and relocated to Osage, Iowa .

Notes and references:

1. With thanks to Jan Berning for information on the patent and the company history
2. With thanks to Bob Jibben for the information from the Egg Grading Manual

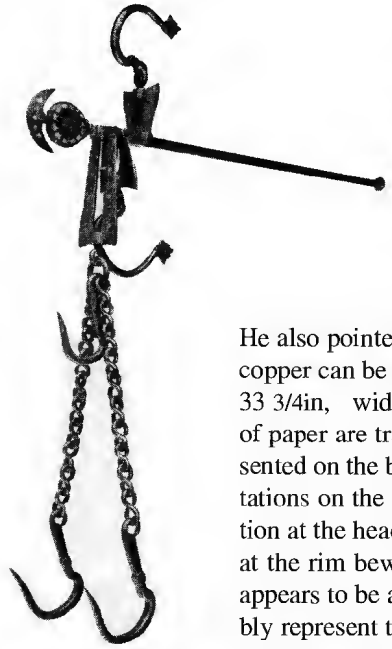
About the author

I have worked all my adult life my life as a heavy duty repairman, welder, electrician, mostly fixing broken stuff from rock crushers to toasters. I have been collecting scales since 1991. The first one was a Mancur bought in an antique shop in Idaho City, Idaho. I marveled at its unique mechanical principles. After that I was hooked. The only other member in Nevada, Mutsuo Yoshisato, saw me looking at scales at an antique shop, introduced himself, and told me about ISASC. My collection includes everything from a Murphy truck scale weight beam and self-lever assembly down to folders and diamond scales. Three hundred or so scales. Lots of steelyards, lots of springs, some testing, counter, egg, postal, kitchen, grain, etc., and a variety of weights. I go to farm and ranch estate sales, yard sales, antique shops, second hand stores, and anywhere else I might find something of interest. I also collect old or unusual tools. I have a room on the garage full of scales. Ray Marie lets me keep a couple in the house. She changes them around for room decor. I have a small display in our local museum and a couple of times a year I put a display in our local library.

Notes & Queries What Kind of Poise?

N & Q No. 147

FROM LOREN BARNET



Thank you for providing the general public with a research database and expertise that is otherwise unavailable.

When this scale was discovered in a damp earthenware basement in Carthage, Misouri by my co-worker, Lee Grimes, it was totally encrusted and unrecognizable, but it was not rusty! Negotiations to buy the scale lasted for weeks, but it was worth it! The artisan who created this piece really put his heart and soul into it, and the metals he used are quite remarkable. Ther metallurgist who tested the inlays stated, "The hardness of this gold alloy exceeds that of any I've seen."

He also pointed out that the scale is forged of an iron alloy containing so much copper that the veins of copper can be seen with the naked eye. This would explain the lack of rust. The dimensions are height 33 3/4in, width 30 1/2in, and depth (measured by the hanger for the chains) 3 1/2in. The long strips of paper are tracings of all four sides of the beam. I have determined that 4 different scales are represented on the beam but have not been able to associate them with modern measure. There are no indentations on the beam other than the graduations. The most significant marking noted is the ornamentation at the head of the beam. On the beam head there is a circle with 13 spokes, with a gold alloy inlay at the rim beween the spokes. This may represent the sun. Outwardly attached to the circle is what appears to be a crescent moon. The moon is inlaid with 5 small circles. Could this arrangement possibly represent the sun, the moon, and the five naturally viewable planets?

Information requested: Age, origin, use, and value are important, but what I seek are the dimensions and weight of the balance weight so I may have one produced. Unfortunately when I purchased the scale, the weight was not found.

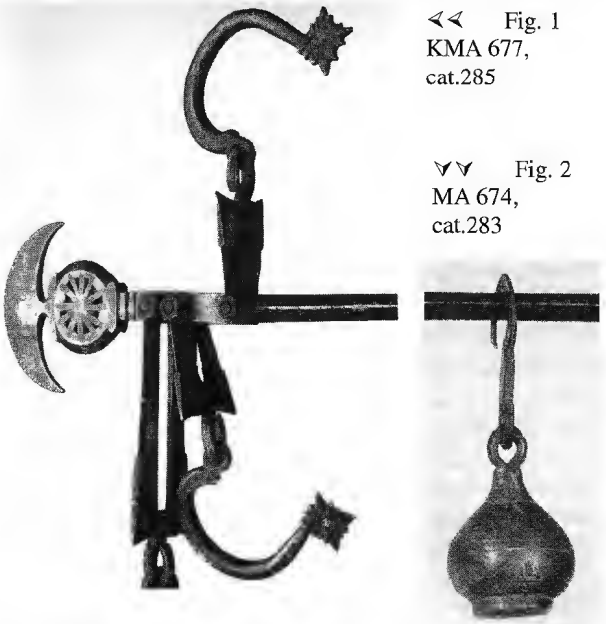
Response: Your scale is an Anatolian steelyard set up to measure from 1 to 18 and 20 to 85 hundred dirhem utilizing two hangers. It is apparently calibrated utilizing two slightly different dirhem weight standards one on each side of the active scale. The older standard of 3.103 grams /dirhem utilizes Turkic notation and the newer (maybe before 1880) standard of 3.24 grams /dirhem uses Arabic number notation. Turkey began its conversion to the metric system in 1880. Because your scale does not have a pan, only hooks, it was probably utilized in a butcher shop, with the hooks firmly anchored in the "ham strings" of the legs of a goat or sheep.

The missing poise gives one the ability to generate a poise to fit any convenient scale system such as for instance pounds. All the scales are multiples of the chosen poise weight. If you choose to create a poise matching the original design, see the shape of Figure 3, use brass, making the maximum bulb diameter 1.057 inches, the height to 2.64 inches and trimming to a weight of 606.7 grams.

Since the poise easily falls off the scale, you also might find a loose poise. Most poises are fairly heavily leaded, and you can adjust the lead to meet the desired weight.

I have no knowledge of value, though I saw dozens of them in Istanbul antique shops a few months ago.

Norman Cima



≺≺ Fig. 1
KMA 677,
cat.285

≻≻ Fig. 2
MA 674,
cat.283

Figs. 1 and 2 depict steelyards virtually identical to yours as shown in the book, *Anatolian Weights and Measures* by Garo Kürkman. (see review, pg. 2838). This style is identified as belonging to the Ottoman period, 18th - 19th centuries.

What is the Weight of the Poise for Barnett's Anatolian Steelyard

Prepared by Norman E. Cima 10/18/2003

Barnett reports by phone the following data

The distance along the complete scale shaft is	30.5 Inches
For the Heavy Scale, the Load Pivot to Hanger distance	5/8 Inches
For the Heavy Scale, the Load Pivot to # 20 on Scale	3 & 1/8 Inches
For the Light Scale the Load Pivot to Hanger Distance is	2 & 5/16 Inches
For the light Scale the Load Pivot to # 2 on the Scale	3 & 5/16 Inches

Measured from the two scale's paper tape rubbing

For the Heavy Scale, From # 20 mark to # 80 mark is	19.59 Inches
For the Light Scale , from # 2 mark to 18 mark is	19.85 Inches

Calculate Poise for Heavy Scale with Dirhem for that Scale of 3.24 Grams/Dirhem

1st Poise Weight Times Lever arm (3.125" + 19.54) = 80 Dirhem in Grams X Lever arm + Constant Moment
Poise in grams X 22.665" equal 80 X 324 Times 0.625 inches + Constant Moment
Poise Weight Times22.665 = 16,200 gram inches + Constant Momemnt

2nd Poise Weight Times Lever arm (3.125 +6.5") = 40 Dirhem in Grams X Lever arm + Constant Moment
Poise Weight Times 9,425 = 40 X 324 times 0.625 + Constant Moment
Poise Weight Times 9.425 = 8,100 Gram Inches + Constant Moment

1st - 2nd Poise Weight X 13.29 = 8,100 Gram Inches
Poise Weight = 8100/13.29 =
Poise Weight = 609.5 Grams

Calculate Poise for Light Scale with Dirhem for that Scale of 3.24 Grams/Dirhem

1st Poise Weight Times Lever Arm (3.3125 +19.85) = 18.00 Dirhem Times 324 times 2.3125 + Constant Moment
Poise Weight times 23.1625 inches = 13,486.5 Gram Inches Plus Constant Moment

2nd Poise Weight Times Lever Arm (3.3125) = 2.00 Dirhem times 324 times 2.3125 + Constant Moment
Poise Weight Times Lever Arm 3.3125 = 1498.5 + Constant Moment

1st - 2nd Poise Weight Times 19.8495 = 11,988
Poise Weight =603.9 Grams

Average Heavy & Light Scales, Poise Weight = 606.7 Grams

Using Excel's Goal Seek to match required Poise Weight

Prepared by Norman E. Cima 11/18/2003

Drawing Vertical Slice Inch	Summation Total Height	Multiplier 0.5282776 Multiple	Drawing Radius inches	Slice Radius Multiple	Slice Weight Grams	Brass Weighs	**139.425** Grams/inch Cubed
0	0	0	0.20	0.1057	0.000		
0.50	0.2641	0.2641388	0.20	0.1057	1.292		
1.00	0.5283	0.2641388	0.20	0.1057	1.292		
1.50	0.7924	0.2641388	0.50	0.2641	8.072		
2.00	1.0566	0.2641388	0.80	0.4226	20.665		
2.50	1.3207	0.2641388	1.20	0.6339	46.495		
3.00	1.5848	0.2641388	1.70	0.8981	93.314		
3.50	1.8490	0.2641388	2.00	1.0566	129.154		
4.00	2.1131	0.2641388	2.00	1.0566	129.154		
4.50	2.3772	0.2641388	1.80	0.9509	104.614		
5.00	2.6414	0.2641388	1.50	0.7924	72.649		
		2.641388			**606.699**	Total weight of Poise in Grams	

This calculated the dimensions for an Anatolia Poise, knowing the desired weight in Grams

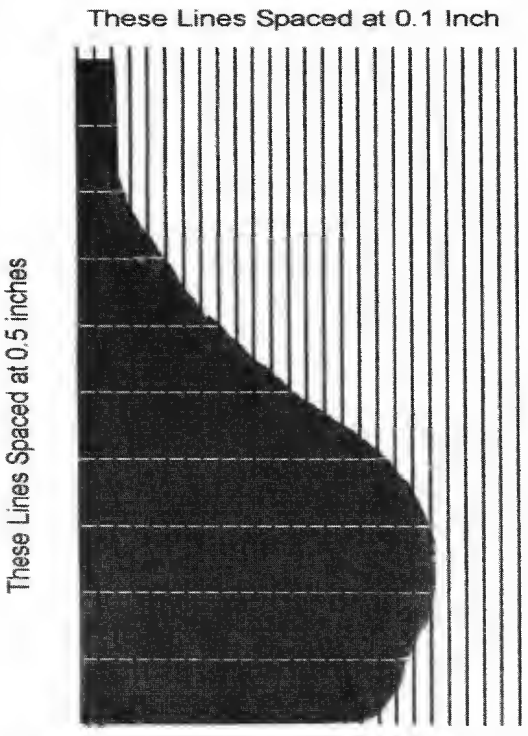
Highllight G19, then go to Tools . Goal Seek, and fill the "to Value" block with the desired weight.

Insert "D6" in the by "Changing Cell" . Then click OK

The height, radius, and weight of the 10 slices are calculated and shown.

The number in D6 multiplies the slice thickness and square of the radius to the appropriate values.

If you are using something other than Brass, put that material's Grams / Cubic Inch in I5



This is an half section of the Standard Design Poise for Anatolian Scales.

See "Poise Design Excel Goal Seek.xls" to convert the required weight in Grams into correct dimension for turning on a lathe
Norman E. Cima
11/18/2003

Anatolian Weights and Measures

BY GARO KÜRKMAN

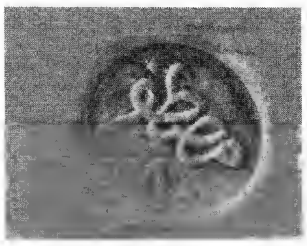
Reviewed by Norman Cima

Turga of Sultan Abdulaziz

Turga of Sultan Ahmed I

Turga of Weight Maker Ali

Documecu Sirketi, Foundry



Assayer Mustafa 8

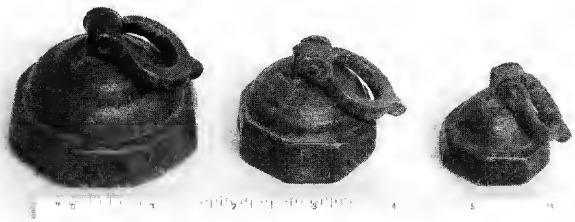
Assayer Hak

Long before the Romans founded Londinium on the North Shore of a large river flowing to the sea in one of their cold and foggy offshore islands, accurate scales were being used all around Anatolia for trading between ancient societies. Leviticus 19:35-37 states "You shall not pervert justice in measurement of length,weight or quantity. You shall have true scales, true weights, true measures, dry and liquid. You shall observe all my rules and laws and carry them out. I am the Lord." The Koran XI:84-85 instructs "Oh my people, give measure and full weight in justice, and wrong not people in respect to their goods."

The Suna and Inan Kirac Research Institute on Mediterranean Civilizations has assembled a museum full of scales and weights used from prehistory to the present around Anatolia, that broad plateau between the Black and the Mediterranean seas that we call modern Turkey. Having successfully published on their ceramics collection they induced Garo Kürkman to create a book on their scales and weights. His six pound, coffee table sized tome shows all 513 items of the collection in magnificent color. Further he shows many detail photos illustrating specific subjects. Moslems obey God's command to create no graven images, but the sweeping script turgas of the Sultans, Municipal Assay Stamps and Marks provide visual evidence of a vibrant past and also great identification for your possible finds. He has included many conversion tables collected from such standard references as Kisch updating and correcting them citing data from the Kirac Collection.

The book starts with weights from the first quarter of the second millennium BC. It continues with Bronze weights used in Mesopotamia in the third century BC. There is extensive coverage of the Greek and Roman periods. The Byzantine period from the 5th-13th centuries AD is covered with a number of scales as well as weight conversion tables from that period.

≺≺ Figs. 1-6
The book contains a great number of turgas defining the full range of Ottoman Sultans plus many builders, assayers and municipalities.

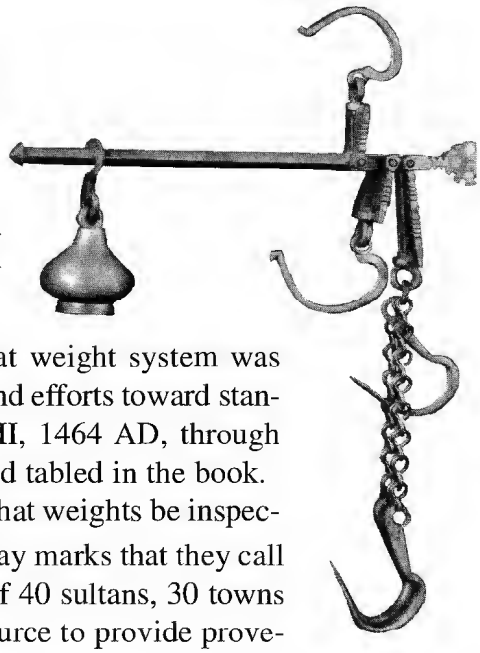


≺≺ Fig. 8.

50, 100, & 200 dirhem weights purchased by the reviewer in 1993 in Istanbul.

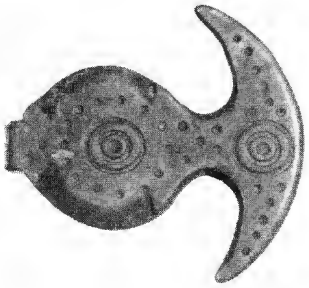
Figs. 9-12 ➢➢

18th century Ottoman steelyard, and three typical steelyard terminals.



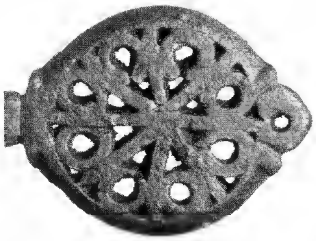
The book's major strength is in its coverage of Dirhem weights. That weight system was derived from the Greek Drachma and this book covers its introduction and efforts toward standardization in Islamic societies. Weights from the reign of Mehmed II, 1464 AD, through Mehmed V, 1909 AD, are measured, explored, illustrated, correlated and tabled in the book. In order to prevent fraud the Ottoman government made it compulsory that weights be inspected and stamped with sweeping stroked, assay marks that they call turgas. Shown in the book are the turgas of 40 sultans, 30 towns and 20 makers, which is a tremendous resource to provide provenance for your random weight.

And then the Metric System came to Anatolia. The book has a copy and translation of the first law promulgating the metric system in Ottoman lands. It has a poster showing the size and construction of all the metric weights and measures. Tables are provided to state and convert old measurements to this new system. It gives one some comparative satisfaction to realize that their world had all the problems of the West.



The book concludes with a photographic Catalogue of each of the items in the KMA (Mediterranean Civilisations Research Institute) collections and a glossary of the local and foreign terms used in the Ottoman Empire.

This is a magnificent book for both your library and your coffee table. One thousand pictures and tables make this a reference book on a world of scales that we in the West hardly know. The book's purpose was to enlighten us, and it has certainly done that. It even identified my set of Anatolian weights that stumped everyone at the 2003 ISASC Convention. At $250.00 delivered from Istanbul, it is a bit pricey. At 25¢ a picture it is a bargain. Available only from Garo Kürkman P.K., 121, TESVIKIYE 80200, Istanbul, Turkey, or kurkman@superonline.com



≺≺ Figure 7
Set of Balance and Weights from 18th Century Iran. Contains a one Dirhem weight plus a set of Miskal weights from 1 to 100.

U S PATENTS 1882 - 1885

TEXT BY RUTH HENDRICKS WILLARD
CAPTIONS BY JAN H. BERNING

From its very beginning in 1790 through 1860, the Patent System (later the Patent Office) was that rare bird, a government agency that turned a profit! The application fees paid by hopeful inventors, which went directly to the office, more than covered the cost of issuing the patents. But in 1861, the first year of the Civil War, the inventors from the 11 seceding states were no longer filing applications, and of those in the remaining states, many were off at war. That year, the receipts fell from $256,000.00 to $137,000.00, a difference of $119,000.00, while expenditures decreased by only $31,000.00. For the first time Congress was called upon to appropriate operating funds for the Patent Office.

Although receipts rose exponentially after the war, so did costs. And from that time forward the Patent Office was hard pressed for funds to keep its systems and services up to the standards required by an explosive increase in the number of hopeful inventors.

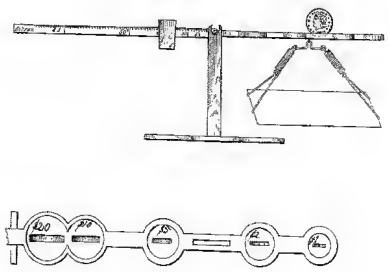


Fig. 1. E C Purnelle's patent no. 292,763 of Jan 29, 1884 combined a postal scale with a CCD. Letters were weighed in the pan and coins could be checked for thickness and diameter on top of the beam.

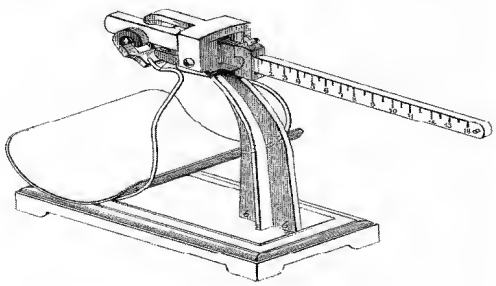
Benjamin Butterworth did everything twice. He was first made Commissioner of Patents in 1882, after he finished his first term as the Congressman from Cincinnati. It didn't take him long to conclude that the main handicap under which the Patent Office was operating was caused by Congress itself. The office had too few examiners, insufficient space, and insufficient compensaton to do the job well. The fees already being paid by applicants were in excess of the amount needed to correct all these deficits. Yet Congress refused to allocate those amounts to the Patent Office.

Determined to remedy the situation, Butterworth ran for Congress again. He was elected to the 49th Congress, where he served from 1895 to 1891 as Chairman of the House Committee on Patents. He declined further nomination for Congress but had the unique accomplishment of being appointed a second time as Commissioner of Patents in 1897. Available records do not reveal whether he ever succeeded in getting the Congressional appropriations increased.

While he was Commissioner, Butterfield compiled a handsome volume of engraved illustrations of many arts entitled *The Growth of Industrial Art.* A copy of that book, which was a Patent Office publication, was recently offered for sale on the internet for $274.95

F F Meyer Jr.'s patent no 292,935 of Feb. 5, 1884. This scale was designed to weigh letters, tea samples, or the tobacco in one cigar

Fig. 2



Hermann Hollerith, who worked briefly in the Patent Office during these years, was also to cast a long shadow. Formerly a census clerk and an M.I.T. instructor, he became an assistant patent examiner. But he had other irons in the fire. For some time, he

had been working on a method of tabulating census results with punch cards. Within a year, he resigned as an examiner to open his own office as an Expert and Solicitor of Patents. He then filed his clients' patent applications on his punch card machines. When the patents were granted, the cards were considered successful and were therefore adopted by the Census Bureau for the 1890 census. Hollerith then founded the Tabulating Machine Company, a predecessor to IBM. He initiated the practice, later to be adopted by IBM, of renting rather than selling his tabulating machines.

The scale patents issued during the years 1883-1885 were varied as to type. Many of the scales during this period, and indeed any period, are combination scales. That is, they were useful for another purpose in addition to weighing. A jack could also weigh a vehicle; a coin tester could also weigh a letter; a cigar cutter could weigh and open a letter, and a scoop could weigh the feed.

In these years the largest group of patents was issued for torsion balances. The Torsion Balance and Scale Company in Cincinnatti, Ohio, must have been bustling, having nine patents to work from. In addition, such patents were assigned to the Howe, Fairbanks, and Emery Scale companies. There were other unusual types of scales as well. These included poise lifting, poise depositing, weight-indicating poise, and foldable platform scales. It is also interesting to note that there was an American version of the English rolling pin scale.

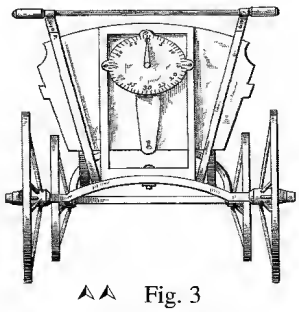


Fig. 3

J J Vinton patent no. 292,878 of Feb. 5, 1884. He designed this spring scale to weigh a baby while it rode in a stroller or carriage.

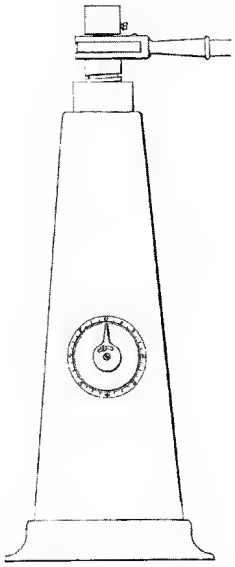


Fig. 4

J Chase's patent no. 306,582 of Oct. 14, 1884.

This jack has a spring inside its cylindrical base to weigh the load as it is being lifted.

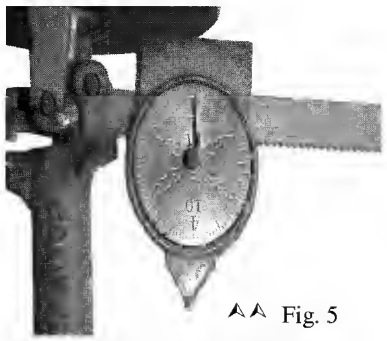


Fig. 5

C D Carter's patent no. 309,925 of Dec. 30, 1884. As the poise slides along the beam, the gear inside causes the dial to rotate so that the user can weigh goods. *See EQM 2607-2610*

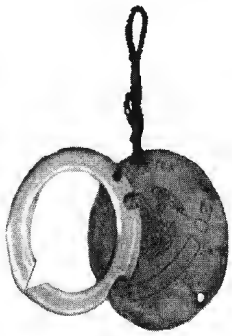


Fig. 6

A C Clausen's patent no. 314,801 of Mar. 31, 1884. This small postal scale was made for cutting cigars as well as opening letters. It was a souvenir of the New Orleans Exposition in 1884-1885. *Thanks to P. Laycock*

Fig. 7

Dr. C H Fitch's patent no. 327,152 of Sept. 29,1885. This is an early, primitive prescription balance by Fitch.

J F Lawrence's patent no. 329,655 of Nov. 3, 1885. This scale has an attached rotating weight tray. The center of the base also serves as a string holder for tying parcels in the shop.

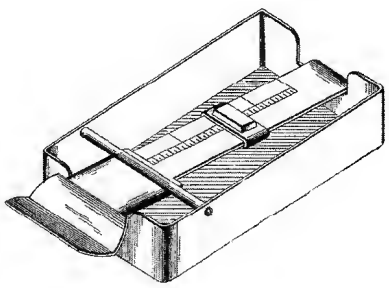
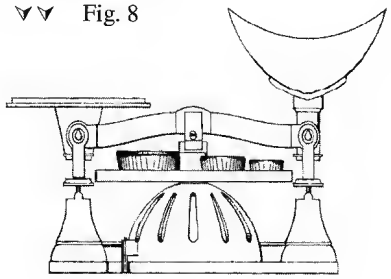


Fig. 8



Patents sorted by date (shop/warehouse platform scale and smaller) 1882-1885

NO	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
264,431	Sept 19, 1882	J B Atwater	Chicago, IL		CCD
264,432	Sept 19, 1882	J B Atwater	Chicago, IL		Postal scale
267,073	Nov 7, 1882	H F E Gerike	Berlin, Germany		Pendulum scale
267,393	Nov 14, 1882	J Ball	Greenville, MI		Pendulum scale
267,776	Nov 21, 1882	M G Cook	Ashfield, MA	1/2 to J N Smith	Weight lifting postal
268,747	Dec 5, 1882	G A Stewart	Wells Tannery, PA		Fork for weighing hay
268,797	Dec 12, 1882	S H Hyde	Alpine, NJ		Combined jack & scale
269,113	Dec 12, 1882	W W	Rutland, VT	Howe Scale Co	Equal arm balance
269,433	Dec 19, 1882	A Leas	West Manchester, OH		Scoop for scales
269,941	Jan 2, 1883	NA L J Johannsen	Brooklyn, NY		Duplex spring scale
270,094	Jan 2, 1883	W T Moore	Richview, IL	1/2 to W H Moore	Sack holder & scale
271,210	Jan 30, 1883	I L Bevis	St. Louis, MO	1/2 to L J Crecelius	Scoop scale
271,726	Feb 6, 1883	C C Miller	Brooklyn, NY	E & T Fairbanks Co	Platform scale
271,790	Feb 6, 1883	H Chatillon	New York, NY	J P & G H Chatillon	Scale pan
272,699	Feb 20, 1883	F F Ide	Springfield, IL		Diamond & watch screw sc
273,667	Mar 6, 1883	M Clarke	Poultney, VT		Coin tester
273,720	Mar 13, 1883	J S George	Bridgeport, CT		Spring scale
273,979	Mar 13, 1883	J & H Friedlander	Memphis, TN		Weighing scoop
274,146	Mar 20, 1883	R Smith	Boston, MA	1/2 to G W Russell	Paper scale
274,202	Mar 20, 1883	T D King	Montreal, Canada		balance
276,180	Apr 24, 1883	A A Houghton	Buffalo, NY		Counter scale
276,693	May 1, 1883	F Huebner	Milwaukee, WI		Pendulum scale
276,701	May 1, 1883	J F Miller	Oakland, CA		Postal sc rolling pin style
277,878	May 22, 1883	D Buoy	Lancaster, PA		Counter scale
278,903	June 5, 1883	A H Emery	New York, NY	Emery Scale Co	Platform scale
279,548	June 19, 1883	A R English	Rochester, NY		Scale beam
279,864	June 19, 1883	W C Farnum	Hoosick Falls, NY	1/2 to E S Peck	self- contained weight depositing scale
280,252	Jun 26, 1883	T D Solomon	Corsicana, TX		Kitchen scale
280,377	July 3, 1883	A A Houghton	Buffalo, NY		Scale beam
280,779	July 10, 1883	P Arnaud & L Gayette	La Ciotat, France		Steelyard
281,567	July 17, 1883	F Schneider	Syracuse, NY		Measure & Weighing Sc
281,753	July 24, 1883	W G Collier	Merced, CA		Platform scale
282,645	Aug 7, 1883	F Kingwell	Chicago, IL		Spring scale
285,204	Sept 18, 1883	E Bachmann	New York, NY		Coin detector
285,815	Oct 2, 1883	F I Hitchcock	Bridgeport, CT		Equal arm spring bal.
287,136	Oct 23, 1883	A Leas	West Manchester, OH		Scoop for scales
289,450	Dec 4, 1883	F W Runge	San Francisco, CA		Spring balance counter sc
290,066	Dec 11, 1883	J E Kimble	Vicksburg, MS		Grain scale
290,153	Dec 11, 1883	P Vaughan	Louisville, KY		Beer scale
290,945	Dec 25, 1883	A B Upham	Peoria, IL	1/2 to H W Wells	Ruler & scale
291,276	Jan 1, 1884	E Bell	Minneapolis, MN		Platform scale for measuring liquids
292,130	Jan 15, 1884	E Morrison & J P Herron	Washington, DC		fabric testing scale
292,763	Jan 29, 1884	E C Purnelle	Seneca, KS		Letter sc & coin tester
292,878	Feb 5, 1884	J J Vinton	Youngstown, OH		Weighing attachment for baby carriages
292,935	Feb 5, 1884	F Meyer Jr	Newark, NJ		Tobacco, letter, tea.bal
293,117	Feb 5, 1884	C A L Totten	US Army		Proportioning wts system

NO	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
293,637	Feb 19, 1884	J A Demuth	Toledo, OH		Duplex check sc beam
294,227	Feb 26, 1884	H Haerter	New York, NY		Spring bal with 2 dials
294,713	Mar 4, 1884	E Wolner	Liverpool, England		Platform scale
295,095	Mar 11, 1884	G D Baird	Washington, IL		Grain scale
295,785	Mar 25, 1884	M Maguire	Baltimore, MD		Folding scale pan
295,809	Mar 25, 1884	C Richtmann	New York, NY		Coin & letter scale
296,470	Apr 8, 1884	E Sirret	Buffalo, NY		Pendulum scale
297,267	Apr 22, 1884	H C Keeler	Ogden, UT		Pendulum scale
299,757	June 3, 1884	N Du Brul	Cincinnati, OH		Torsion Balance
299,758	June 3, 1884	N Du Brul	Cincinnati, OH		Torsion beam scale
299,759	June 3, 1884	Du Brul	Cincinnati, OH		Torsion EAB scale
299,760	June 3, 1884	N Du Brul	Cincinnati, OH		Torsion beam scale
299,761	June 3, 1884	N Du Brul	Cincinnati, OH		Torsion beam scale
299,762	June 3, 1884	N Du Brul	Cincinnati, OH		Torsion platform scale
300,875	June 24, 1884	J F Lawrence	Philadelphia, PA	J Lawrence	Toy scale
302,402	Jul 22, 1884	T H Herndon	West Point, MS	G P Herndon	Sc with mercury indicator
302,990	Aug 5, 1884	C Forschner	New York, NY		Hanging scale pan
303,133	Aug 5, 1884	W W Edmonds	Fenwick, MI		Folding steelyard/pan
303,806	Aug 19, 1884	G H Chatillon	New York, NY		Hanging scale pan
303,905	Aug 19, 1884	L R Witherell	Davenport, IA		Portable vehicle scale
304,172	Aug 26, 1884	G H Chatillon	New York, NY		Hanging scale pan
304,546	Sept 2, 1884	J O'Grady	Newton, MA	J O'Grady & E Farnell	Hanging circular spring balance
304,587	Sept 2, 1884	T H Ward	Tipton, England		Metal stength tester
305,947	Sept 30, 1884	F F Meyer Jr	Newark, NJ		Shop scale
306,581	Oct 14, 1884	J Chase	Rochester, NY		Weight determining jack
306,582	Oct 14, 1884	J Chase	Rochester, NY		Weight determining jack
308,198	Nov 18, 1884	D L Roberts	Royalton, NY		Union scale
308,321	Nov 18, 1884	W R Morse	Chester, OH		Triple beam net wt scale
308,440	Nov 25, 1884	J E Smith	New York, NY		Letter scale
309,925	Dec 30, 1884	C D Carter	Detroit, MI	H C Hart Mfg Co	Rotating, indicating poisc for scale beam
310,471	Jan 6, 1885	A Springer & F A Roeder	Cincinnati, OH		Support for scale beam
310,542	Jan 6, 1885	A Springer & F A Roeder	Cincinnati, OH		Torsional pivot balance
310,545	Jan 6, 1885	A Springer	Cincinnati, OH	Torsional Bal & Sc Co	Torsion balance
311,010	Jan 20, 1885	H C Keeler	Ogden, UT		Pendulum scale
311,745	Feb 3, 1885	D. Hallock	New York, NY		Poise lifting scale
312,583	Feb 17, 1885	C Richtmann	Newark, NJ	R E Watson	Steelyard postal scale
312,779	Feb 24, 1885	M H Wiener	Buffalo, NY		Cog type wt indicating Poise & beam
312,857	Feb 24, 1885	L C Irvine	Oregon, MO		Indicating poise for lever sc
313,468	Mar 10, 1885	C Becker	New Rochelle, NY		Equal arm balance
313,477	Mar 10, 1885	H S Davids	Oakland, CA		Bent lever postal sc
313,935	Mar 17, 1885	A H Handlan Jr	St Louis, Mo		Wt determining jack
314,330	Mar 24, 1885	W W Haas	Farmer City, IL		Coin counter & tester
314,599	Mar 31, 1885	R A Mitchell & J Von Thurn	Helena, OH		Farmer's scale
314,717	Mar 31, 1885	J E Pitrat	Gallipolis, OH		Price computing scale
314,801	Mar 31, 1885	A J Clausen	MinneapolisMN	2/3 to J C Slafter & A A Pond	Letter opener, scale, cigar cutter
316,178	Apr 21, 1885	W. W. Reynolds	Rutland, VT		Folding platform sc.

NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
319,637	June 9, 1885	J H Stevens	Sandwich, MA		Coffee scale on mill
320,776	June 23, 1885	A Gerdum	Cleveland, OH		Counter sc / check bar
322,100	Jul 14, 1885	F I Hitchcock	Bridgeport, CT		Double beam sc with indicating dial
322,870	Jul 21, 1885	A Turnbull	New Britain, CT		Box scale with upright indicator
323,371	Jul 28, 1885	L G Spencer & P F Hazen	St Johnsbury, VT	E & T Fairbanks & Co	Butter scale
324,465	Aug 18, 1885	E Fuchs	Chicago, IL	1/2 to K Schrimpf	Locket coin & letter sc
324,668	Aug 18, 1885	J Dollison & J Long	Salesville, OH		Bag holder, hand truck &scale
325,534	Sept 1, 1885	D Hallock	New York, NY		Poise lifting postal sc
326,025	Sept 8, 1885	F Fairbanks	St Johnsbury, VT	E & T Fairbanks & Co	Portable or folding sc
326,067	Sept 8, 1885	A A Sturtevant	Hartford, CT		Sewing machine tension
326,815	Sept 22, 1885	W Watkins	Moss Point, MS		Price/wt computing sc.
326,975	Sept 29, 1885	W B Guild	Boston, MA		Equal arm balance
327,125	Sept 29, 1885	C H Fitch	Middletown Springs, VT	1/2 to B S Fitch	Portable prescription scale
327,530	Oct 6, 1885	M G Cook	Lynn, MA		Poise lifting postal sc
328,804	Oct 20, 1885	Palmer	Syracuse, MO	1/2 to M E Taylor	Rotating, computing beam
329,100	Oct 27, 1885	C H Tillmeyer & G W Bolton	Milwaukee, WI	Bolton to Tillmeyer	Folding, portable rack for scales
329,655	Nov 3, 1885	J F Lawrence	Philadelphia, PA	J Lawrence	Combination scale, rotating wt tray,& twine box
330,397	Nov 17, 1885	R L Hassell	Chicago, IL		Scale beam with indicat ing poise
330,595 scales	Nov 17, 1885	A Leas	West Manchester, OH		Scoop bal attachment for with tare
330,690	Nov 17, 1885	L B Gibson	Addison, NY	1/2 to P Evans	Computing beam counter scale
331,020	Nov 24, 1885	E C Bankwitz	Bridgeport, CT		Jewelers or druggist scale
331,090	Nov 24, 1885	E Sauermilch	New York, NY		Hanging computing spring bal.
331,640	Dec 1, 1885	W F Irvine	Lampasas, TX		Boxed spice, shot or powder scale
331,802	Dec 8, 1885	T J Lumis	Hartford, CT		Letter scale

Celebrity Inventors

Throughout the years, many famous people were granted patents. Notably absent from that list are Benjamin Franklin and Thomas Jefferson. Neither of them believed that someone should hold exclusive rights to an invention that would benefit mankind. Abraham Lincoln is the only President to be granted a patent. Its purpose was for buoying vessels over shoals.

Samuel Clemens (Mark Twain) had three patents: an improvement in adjustable and detachable straps for garments, a self-pasting scrapbook, and a game to help remember historical dates. Other celebrity inventors include Lawrence Welk, lunch boxes; Zeppo Marx, a wrist-alarm for persons subject to heart attacks; Danny Kaye, a blowout toy; and Harry Houdini, a diver's suit. Many other people became famous because of what they invented, among them Thomas Edison, Alexander Graham Bell, and the Wright Brothers. If you are curious about some weird things that should never have been invented, you can visit www.totally absurd.com or www.patent.freeserve.co.uk.

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QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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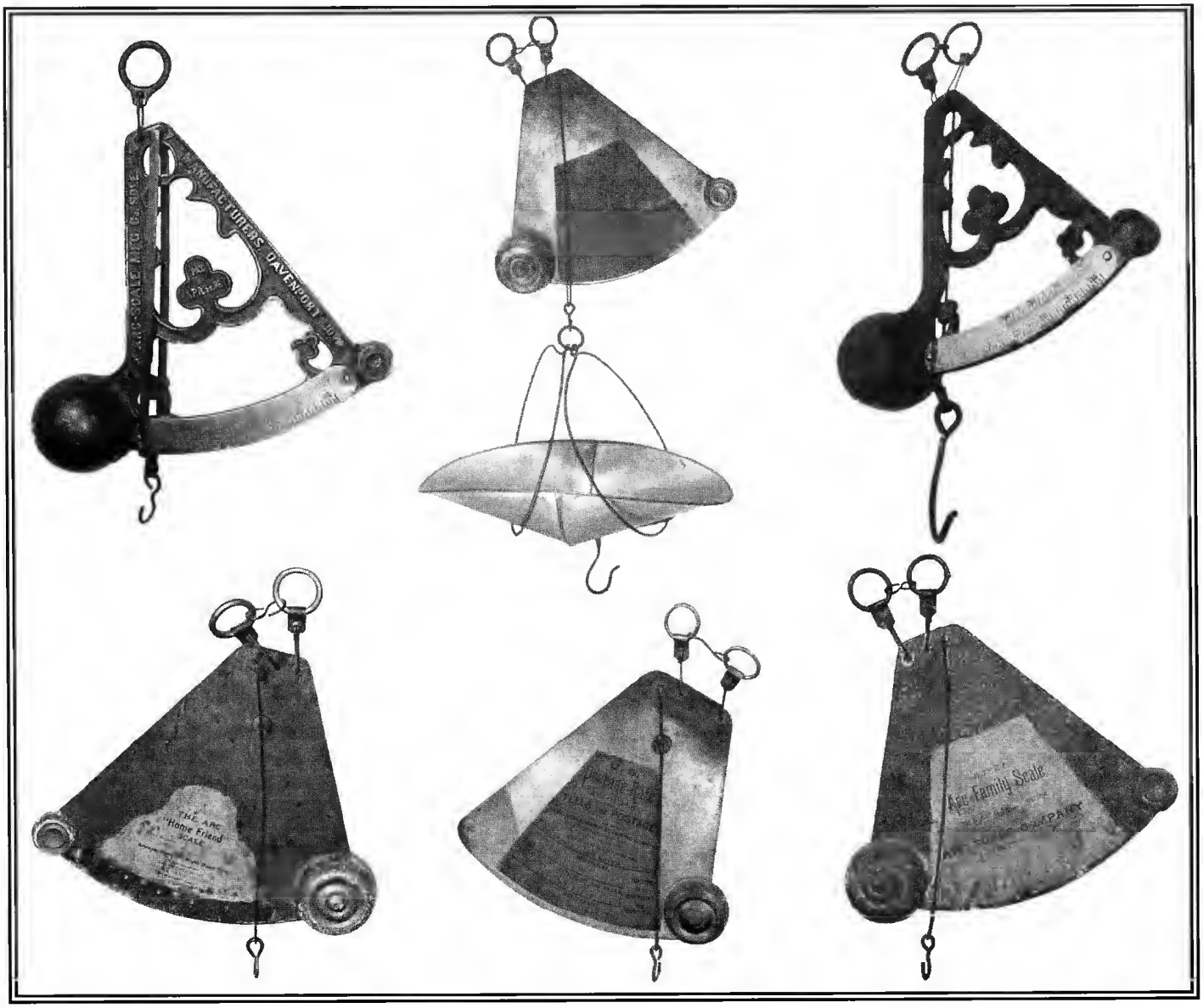
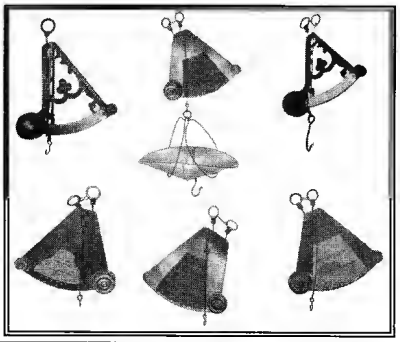


Cover Picture

The cover photo shows all the types of scales known to have been made by the Arc Scale Manufacturing Company in Davenport, Iowa. Loren Witherell patented the scale but he never held an office in the Arc Scale Company. It is known that he had other businesses, prior to the scale business, housed in the same building. One of the two buildings used by the Arc Scale Company is still standing in downtown Davenport.

All but one version of the scale has a double fulcrum and a double scale. The single fulcrum version, at top left, has an additional, unused hole at its top center to accommodate an additional fulcrum but it only has one scale graduated from 0 to 24 1/4 pounds by one ounce.

Contents



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Grain Testing Scales

BY M A CRAWFORTH

Editors note: This is a reprint of an article that Michael wrote around 1988. He was an expert in many areas of collecting scales and we can still learn from his expertise. In many cases the original photos and drawings were used.. Due to the fact that the original photos are no longer available, some new ones were made and slight changes, not affecting the information, were made in the captions.

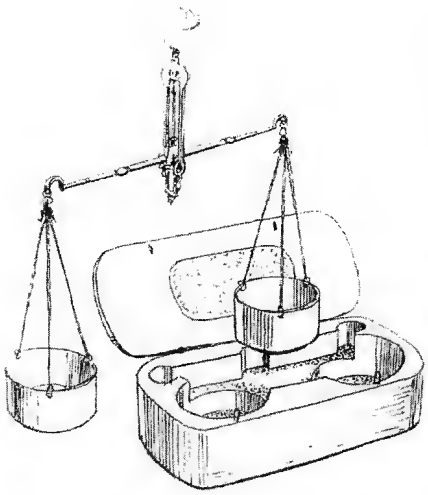


Fig. 1. ⮜⮜ Believed to be one of the earliest English grain scales, equal arm type. Made by John Snart, London, c.1710.

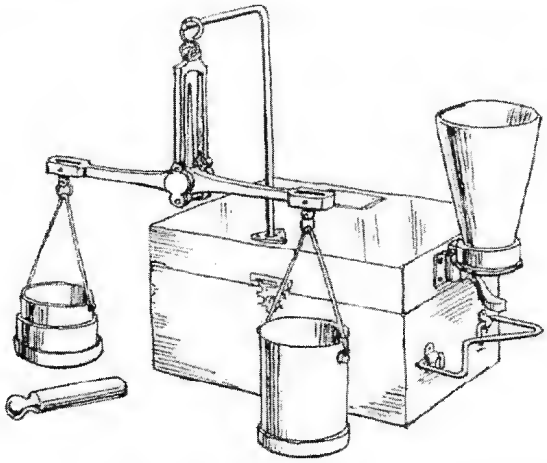


Fig. 2. ⮝⮝ Russian grain scale with funnel filling device, c.1900.

Grain has been an important part of man's life since the beginnings of civilization, as have many other seeds of cultivation. But even now, with all our scientific farming, the size of seed varies from season to season; the moisture content fluctuates; and the inclusion of weeds, chaff and grit varies according to the care of the harvesters. It is hardly surprising, therefore, that buyers of grain and seeds for food processing and flour making have always been very careful to check the quality of the produce they were offered.

Farmers were equally careful when buying seeds from

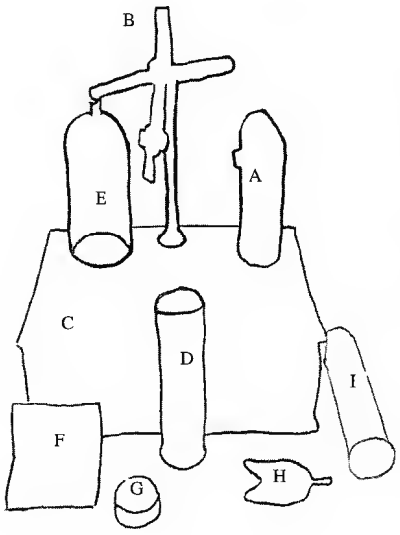


Figure 3 ⮞⮞ A complex German grain scale made by Louis Schopper of Leipzig in 1940. Due to the wartime shortage of metals, the weights were made from zinc alloy. Courtesy B Jibben

Key to figure 3. ⮜⮜ A - Bucket. B - Scale beam. C - Fitted box. D - Fitted pipe. E - Weight plate. F - Weights. G - Suction cylinder. H - Striking knife. I - Discharge cylinder. Courtesy C Miller

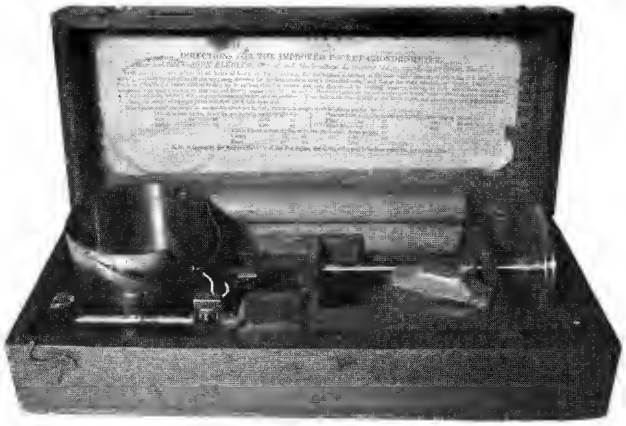


Figure 4. ⅄⅄ An English steelyard "chondrometer" in its fitted mahogany box, made by John Bleuler, London, c.1820.

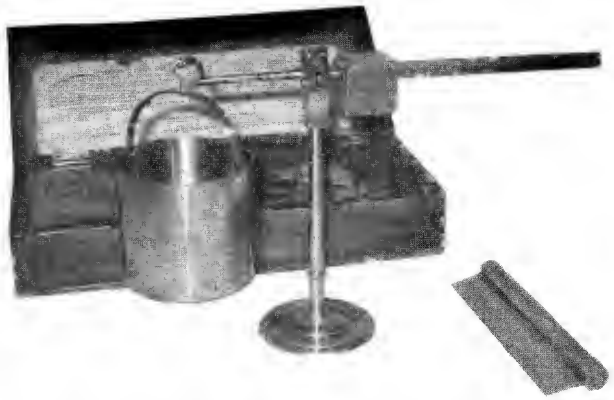
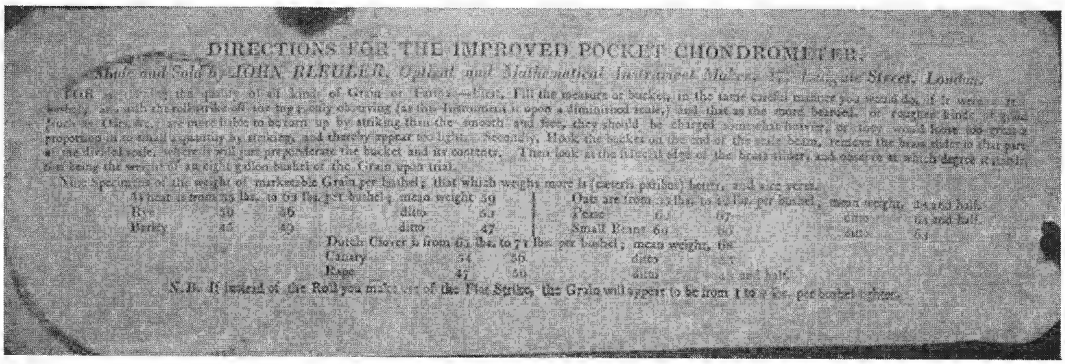


Figure 5. ⅄⅄ Bleuler's chondrometer in use. The combined roll and striker is shown at right. Length of beam 8ins.


DIRECTIONS FOR THE IMPROVED POCKET CHONDROMETER.

Made and Sold by JOHN BLEULER, Optical and Mathematical Instrument Maker, [illegible] Street, London.

Nine Specimens of the weight of marketable Grain per bushel; that which weighs more is (ceteris paribus) better, and vice versa.

Wheat is from 55 lbs. to 69 lbs. per bushel;		mean weight 59		Oats are from [illegible] lbs. to [illegible] lbs. per bushel,		mean weight, [illegible] and half.	
Rye	50	56	ditto 53	Peas	61	67	ditto 64 and half
Barley	45	49	ditto 47	Small Beans	60	66	ditto 63

Dutch Clover is from 61 lbs. to 71 lbs. per bushel; mean weight, [illegible]

Canary	54	56	ditto
Rape	47	50	ditto [illegible] and half.

N.B. If instead of the Roll you make use of the Flat Strike, the Grain will appear to be from 1 to 2 lbs. per bushel richer.

Figure 6. ⅄⅄ The instruction label for Bleuler's chondrometer provides a table of weights for various grains and pulses. The user was expected to be well educated! The "fiducial edge" is the bevelled reading edge of the sliding weight, and "caeteris paribus" is Latin for "other things being equal".

which to grow crops. No doubt many of them had a good eye and "feel" for the quality, but for some centuries they have called upon science to provide a more accurate assessment.

This was done by weighing a small sample of the grain, usually as little as a quarter of a pint. The weight was compared with a chart of optimum weights for that particular grain, to ascertain its quality.

Various types of scales were used for testing grain and seeds, but commonly it was an equal-arm beam with two hanging buckets that was used, like the one made by John Snart, c.1710 (figure 1). This early example has a polished iron beam of high quality, brass buckets holding one eighth of a pint, and a box cut out from a block of pearwood. The recess for the scales is lined with hand-cut red velvet. Inside the lid is glued the maker's label which includes the Royal Coat of Arms of Queen Anne for the period 1707-1714, implying that this famous maker had royal patronage.

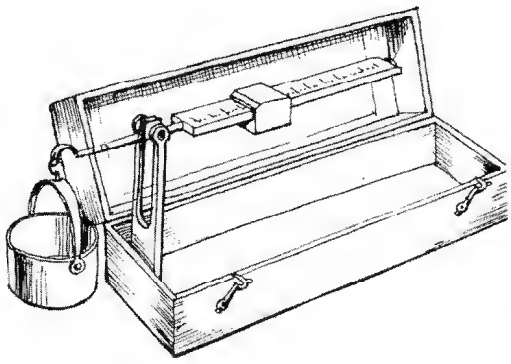


Figure 7. ⅄⅄ A folding pillar on this English chrondrometer made erection of the instrument quick and easy. Late 19th century, unsigned.

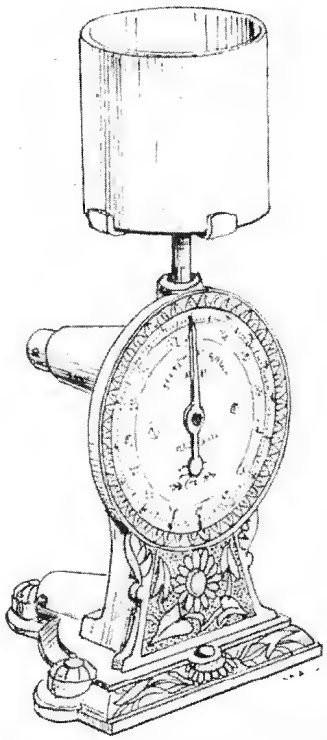


Figure 8. ⩓⩓ A spring grain scale made by Geo. Salter & Co. c.1890. Dual graduations show the actual weight of the grain, and the weight per bushel.

To ensure consistency, the bucket on grain scales was of a recognised capacity and it was filled to overflowing. The excess grain was then struck off the top with a specially shaped wooden "striker", by wiping the striker across the top of the bucket. In some countries, the striker was a cylindrical wood rod which slightly compressed the grain into the bucket (figure 12). In England, the striker was usually a combination of cylinder and wooden "knife", so that the user could choose slight compression or a clean cut between the grains (figure 5). This choice was related to the custom, in some parts of the country, whereby the grain sold in bushel measures was "stricken" with a wooden blade. Therefore, the sample had to be stricken with a wooden blade. In other areas, a cylindrical "roll" was used for both the sample and the grain sold. The difference between the two methods was significant, because the roll packed 2%-4% more grain into the container. Achieving consistency in packing grain into the bucket of grain scales was not easy, and it was a problem which occupied the attention of some scale and instrument makers throughout the history of test weighing grain.

Figure 9. ⩓⩓ A pendulum grain scale made by Louis Schopper of Leipzig, c.1890, for the British market. The funnel has two positions, the higher one giving a slightly denser packing of the grain. Height 16 1/2 ins.

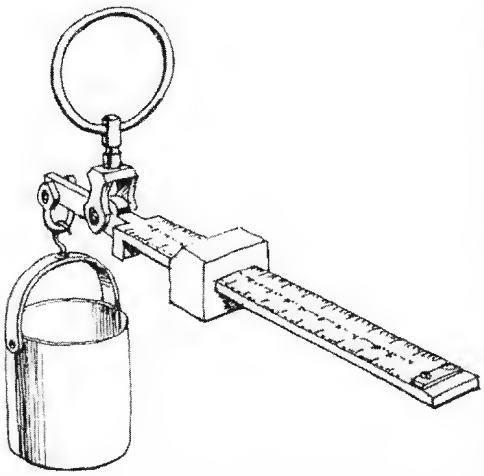


Figure 10.. ⩓⩓ A hand -held grain tester made by Fairbanks & Co. of America, c.1900. It includes graduations for the percentage of good grain.

A Russian equal-arm scale from the late 19th century (figure 2) shows evidence of the interest in improving consistency, as in other parts of Continental Europe. A conical funnel was provided with a spring-loaded shutter at the bottom. When the shutter was released with a trigger, the grain poured in a controlled manner into the weighing bucket supported on a bracket below. This eliminated the inadvertent (or fraudulent) variations caused by the human hand.

Further improvements in consistency were developed in Germany, in 1912, when an improved method of filling was devised, and in 1937, when the dimensions of the tester, especially the bucket, were

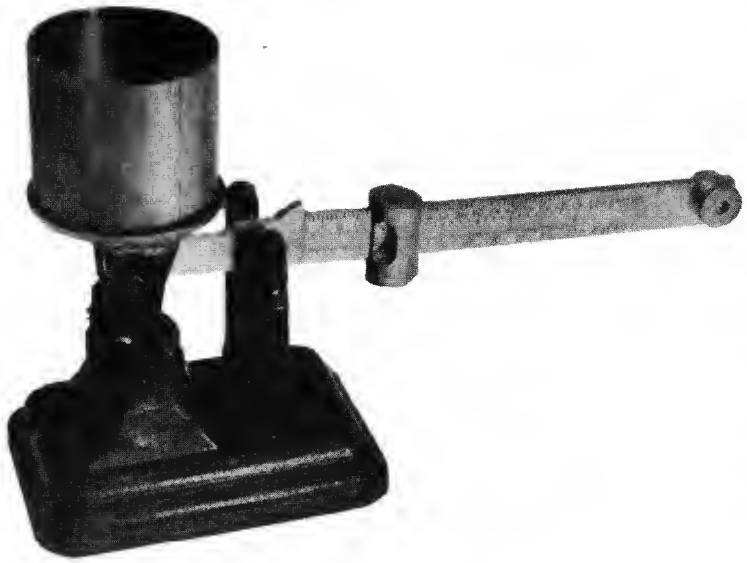


Figure 11. ⅄⅄ A table steelyard grain scale, or "cornometer", made by Fairbanks & Co. of America, c.1920. Brass with an iron base.

strictly controlled by legislation. The result was a complicated apparatus familiar to the Continental collectors of scientific instruments (figure 3). Much less familiar is the way in which they were used.

The method of weighing with these German grain scales was unknown to most scale collectors, until a German member of ISASC* discovered an old corn wholesaler who remembered using such a scale, years ago. The author's family and the German collector's family invaded the wholesaler's premises and all learned to operate the instrument. It took several attempts to learn the correct sequence, with some hilarity and spilt grain. The method needed recording for posterity, as it was already apparent, by 1978, that fanciful ideas were accruing about these complicated scales. The knowledge was nearly lost, and what a pity it would have been if yet another specialised scale had had to be labeled "unknown function".

Before testing can begin, with the German grain scales, the grain must be air-dried. Then the tests are carried out at room temperature with a humidity of between 50% and 75%. The scale beam is set on its pillar on top of the box, and the striking knife "H" is inserted into the slot near the top of the bucket "A". On top of the knife is placed the suction cylinder "G", and over that the filler pipe "D", which is fitted to the top of the bucket.

Then follows the careful procedure of filling the bucket, without using a funnel, because the latter could give variable results. A discharge cylinder "I" is filled from the sack of grain and emptied into the filler pipe. The user is instructed to pour slowly and steadily so that the grain does not touch the sides of the pipe, taking about twelve seconds for the one-litre size bucket.

When all the grain from the discharge cylinder has been poured into the filler pipe, the striking knife is pulled out quickly. The suction cylinder drops, creating a vacuum below

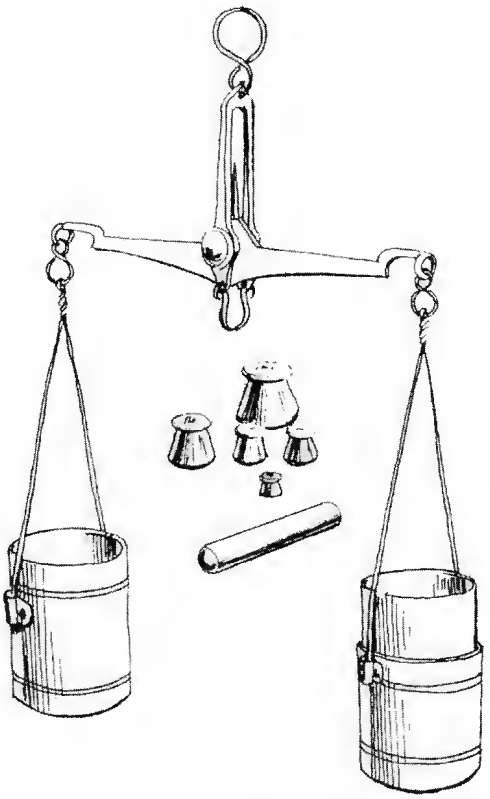


Figure 12. ⅄⅄ An equal-arm grain scale made in the Netherlands, early 19th century. The buckets fit together to make a container for the weights, beam and wooden roll.

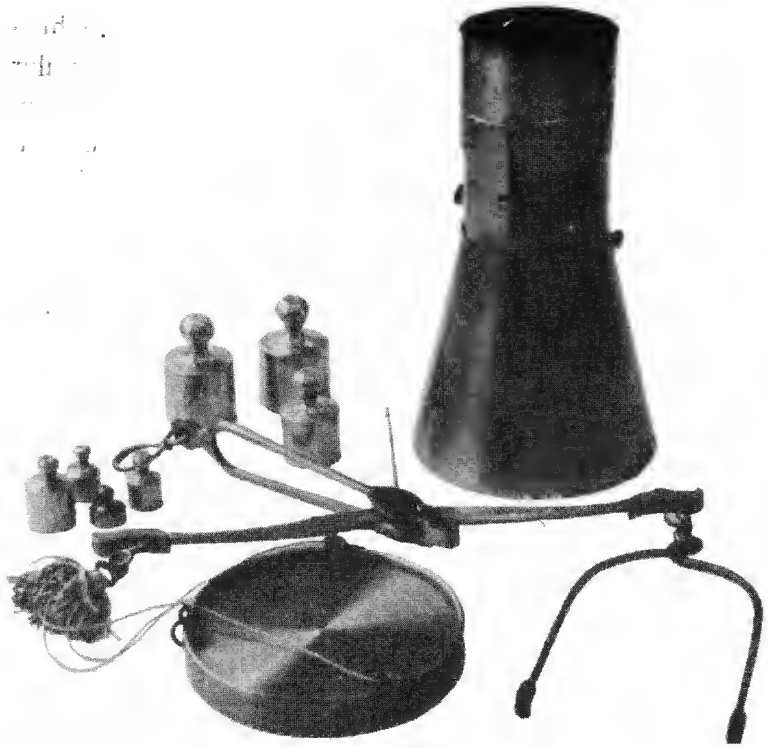


Figure 13. ⅄⅄ A Swedish grain scale, 19th century, unsigned. The bucket capacity can be varied by sliding the telescopic neck to the required notch. The bucket is suspended from the U-shaped wire hanger.

the grain, thus causing it to fall and settle consistently every time the tester is used. Holes in the bottom of the bucket allow air to escape from below the suction cylinder.

At this stage, the striking knife is put back into the slot, cutting off any extra grain above the bucket. The excess grain is tipped out, and the knife and filler pipe are removed. At last, weighing can begin. The bucket is suspended from the scale beam "B" and the grain is weighed, using the weights provided.

By looking up the measured weight in the conversion tables, the corresponding weight for the hectoliter is determined. Each type of grain or seed has its optimum weight. If it is lighter or heavier, the utilisation factor is poorer, so the corresponding value is lower.

In marked contrast to the lengthy and precise procedure used in Germany, developments in Britain were for convenience and speed. At the end of the 18th century, a scale of the steelyard type was adapted for grain testing.

It was called a "chondrometer", and was much used in corn exchanges, on farms and, later, in food processing factories, throughout the country. The instrument was normally contained in an attractive mahogany box with turnbuckles to retain the various component parts (figure 4). (Any wear caused by rattling around in the box would have reduced the accuracy of the scale.) When assembled, the beam rested on the top of a turned pedestal, and a grain bucket was suspended from the end (figure 5). In use, the bucket is filled and struck across the top, and then suspended from the weighing beam. A sliding weight is moved along the beam until it balances, and then the estimated weight, in pounds per bushel, is read directly from the graduations on the beam. Guidance on optimum weight for different seeds was usually provided on the label inside the lid of the box (figure 6). Some early chrondrometers were calibrated in pounds per comb, a comb being four bushels. The British emphasis on speed was further developed, in the late 19th century, when the pull-up pillar (figure 7) was devised as an alternative to the free-standing pedestal which had to be screwed in or set up before weighing could begin.

If many samples of grain had to be tested - and there usually were many - the most convenient form of scale was a self-indicating instrument, where no loose or sliding weights had to be

manipulated. In the 1890s, Geo. Salter & Co. made a spring balance with a dial indicator, which provided an instantaneous read-out in pounds per bushel (figure 8). It was based upon their popular letter-balance which is now often seen at antiques fairs, with an attractive copper-bronze finish on the decorative cast iron base. There was, however, a penalty to pay for speed and convenience. The spring balance was not quite as accurate or so sensitive as the equal-arm beam scale or the steelyard. Speed was also the theme behind the late 19th century pendulum grain scales made by Louis Schopper of Leipzig (figure 9). Here, the bucket is filled from the funnel and then suspended from the beam. The latter then swings round, automatically finding its own point of balance. Weight per unit volume could then be read directly from the graduated quadrant. This type of instrument was also imported into Britain, marked in pounds per bushel. Some of Schopper's balances were marked with his name, others with his trademark.

In America, the Fairbanks "grain tester" was a hand-held instrument of the steelyard variety, with a bucket capacity of half, two or four pints (figure 10). The beam was marked with three sets of graduations to indicate the actual weight of the sample, the estimated weight per bushel, and the percentage of good grain. To determine the latter, the sliding weight is set to 100%, and grain is poured into the bucket until the beam balances. The grain is removed and all dirt and chaff is taken away. The grain is returned to the bucket and, after re-balancing by adjusting the position of the weight, the percentage of good grain is read directly from the beam, at the new position of the weight. Similar facilities were provided on the Fairbanks table-steelyard (figure 11) which, unlike its British counterpart, was not intended to be readily portable.

In Europe, portability was considered a worthwhile feature, and compact containers were developed to fit in the pocket. In Holland and Germany, the buckets of equal-arm scales were made to fit together to make a cylindrical box containing the beam and weights (figure 12). The weights were marked with a series of numbers - 1, 2, 3, 4, 5, 10, 20, 40, 60. These numbers were not the weight value of the weights, as one might expect, but were the estimated weight of a sack of grain, a sack being a specific volume. In Sweden, a telescopic bucket was provided so that the capacity could be varied for different types of grain (figure 13). This worked using a row of graduated notches engaging on a pin, on the same principle as the familiar English adjustable gunpowder measures of the 19th century.

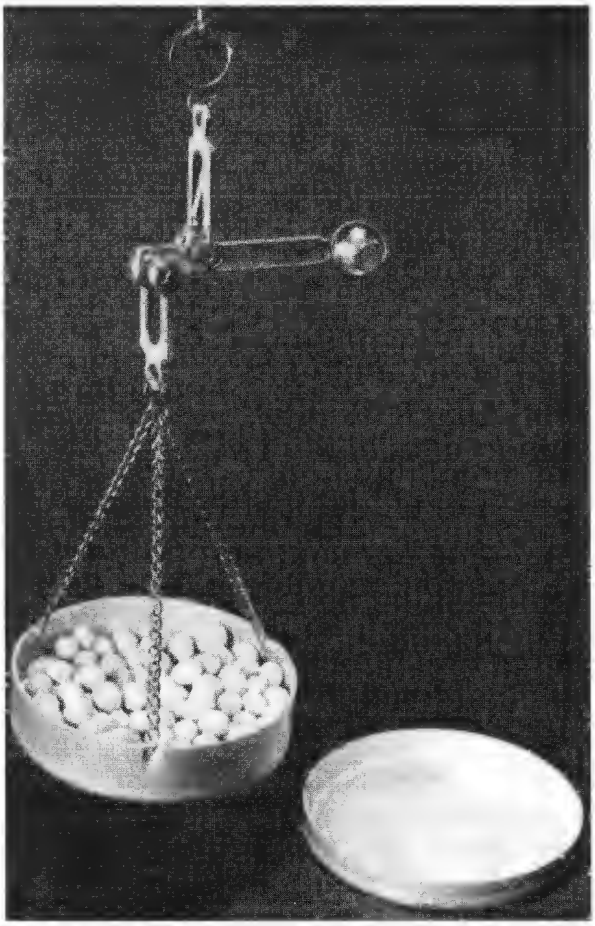


Figure 14. A chick-pea scale from Spain. The instrument fits inside the bucket and the lid fits on top. Beam length 2 1/2ins.

In Spain, the chick-pea scale (figure 14) worked in a different way. It was a tiny pocket-sized scale which fitted inside its pan, and was covered by a loose lid. The weight had a fixed position to balance one onza of chick-peas. To check their quality, chick-peas were first passed through eight grades of sieve, and the peas of one grade were placed in the scale pan until the pan balanced. The peas were then poured out and counted. The number of chick-peas indicated the quality, forty per onza being considered the best and seventy-two per onza the poorest.

The chick-pea scale was another instance of fast-disappearing knowledge. Scales were known, but their purpose and method of use was almost forgotten until a Spanish member of ISASC did some research. She managed to find several elderly farmers who not only described how they used the scales, but also mentioned that the scales used to be made in Barcelona, a thousand kilometers from the farms, and that there was still one old scale-maker who had, in the past, made chick-pea scales commercially. With a little persuasion, he agreed to make some more scales in the time-honoured style, and the example illustrated in figure 14 is one of them.

Figure 15. ⍋⍋ This French grain scale, by Tripette et Renaud Fils of Paris, reads actual grain weight, so conversion tables are needed to find kilograms per hectolitre. Early 20th century.

Grain scales of all kinds are much sought after by scale collectors and scientific instrument collectors. English chondrometers are particularly attractive, being made precisely from brass and polished iron, contained in mahogany boxes and provided with a label of instructions. The latter often refer to the "Act of Parliament 1826". This Act set down standards for the measurement and sale of grain in 1824 but did not become effective until 1st January 1826. It did not cover the design or use of grain testing scales, but standardised the volume of bushel measures which, previously, had been of different capacities in different parts of the kingdom. Thus it enabled chondrometer makers to standardize their instruments.

Notes & References

Berastegui, Sue. "Chick-pea Scales", *Equilibrium* pages 420-421.

Crawforth, Michael A. "Grain Scales", *Equilibrium* pages 80-82.

Schmidt, Utz. "German Grain Scales", *Equilibrium pages* 51-53.

Anon. *Vergleichstafein für Getreideprober,* Berlin 1941.

Manufacturers' catalogues: Geo. Salter & Co., E & T Fairbanks & Co.

*ISASC = International Society of Antique Scale Collectors.

What's My Line - Scale Collecting Adjuncts

BY J R KATZ

I was awakened through the collecting and selling process that sometimes makers had other product lines. What's especially exciting is learning about or finding an example of the "other product". In the following text I provide a few of my awakenings which all are related to scale makers.

Figural Letter or Paper Clip - These have been made for many years and at least back to the Victorian era. Used generally at the desk for holding papers, letters, bills, etc. Made of brass or cast iron and in shapes of birds, animals, ladies hands, knights armor, etc. (Note: Cast iron ones today are coming on the market as reproductions.) Some time ago I came across a paper clip (fig.1) made of sheet brass in the form of a ladies hand. This one was made with spectacular detail and superbly finished; better than any other hand shape I had ever seen. On closer examination evidence bore me out. It was stamped in an obscure spot, "J & E Ratcliff, Patentees, Birmingham". The British design registry code was more apparent but inconspicuously included as part of a band around the wrist; it was for the year 1844.

Fig. 1

Who else but THE Joseph and Edmund Ratcliff of postal scale fame and makers of those candlestick and rolling pin (fig. 2) scales! Did they make this line and perhaps other related merchandise to supplement their scale production? One thing was clear - the workmanship was on a par with that of their scales. Until this discovery I never associated the Ratcliff brothers with anything but scales, and their name stamp on the paper clip was my proof.

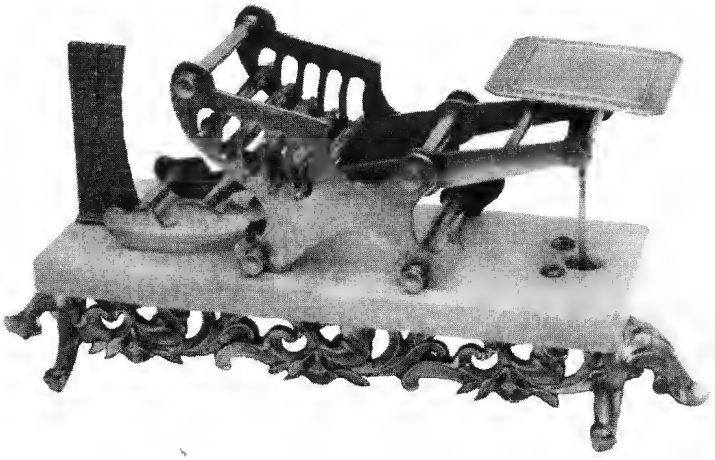
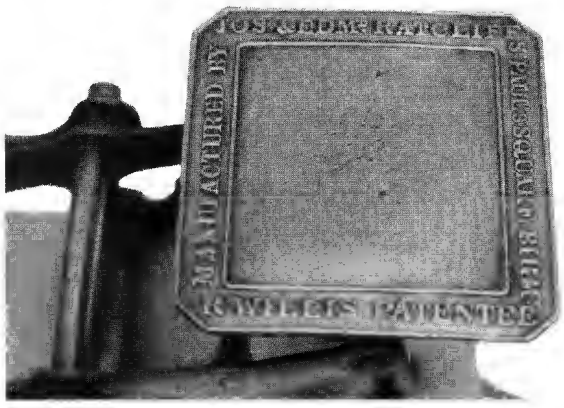


Fig. 2b

Fig. 2a



Pen Nib - Most can recall the days when pen nibs were purchased for use with the straight stick pens, long before fountain and ball pen eras. While clearing out the inventory of an old general store, a large box came to my attention, containing dozens of small boxes of old but unused pen nib assortments, many by different makers. Curiosity caused me to examine each of these little

Fig. 3

boxes, most still full of nibs. Most had very colorful lithographed labels; these labels in themselves were enough reason to collect the nib boxes. One box in particular held my attention for a while. The label read, "M. MYERS & SON - GOLDEN EAGLE PEN" (fig. 3). Additional wording on the side of the box (fig 4) clinched it - "M. MYERS & SON'S LTD PATENTEES BIRMINGHAM." Wasn't there a firm by that name which made (or had made for them) the little bow front spring postal balances (fig. 5), ca 1920 - 1940? The scale's dial on which the weights and postal rates are printed carries the name in small print at the bottom, "M. MYERS & SON LTD - MADE in ENGLAND". One and the same firm? Absolutely! But was Meyers a stationary house or a scale maker or both?

Ratchet Screw Driver - Men most likely remember the "Yankee" screw driver (fig. 6); it was made by NORTH BROS MFG CO, PHILADELPHIA. (Note: In 1946, Stanley Tool Co. bought out North Bros.) Just about every tool chest in the early 20th Century had one. That screw driver went through a rather long evolutionary process, so there are many versions. What's a screw driver got to do with scales? Some members may have in their collection a family scale, spring balance principle, made of cast iron and built like a Duesenberg!! The circular brass dial face is marked, "US SCALE, PATD 1877", (fig. 7) an embossed stamping on the top of the body reads, "NORTH BROS MFG CO, PHILADELPHIA". The Thomas' Register of American Manufacturers - Buyers Guide, 1905 - 1906, lists under both subjects "Family Scales" and "Drivers, Automatic, Ratchet Screw", the name NORTH BROS. North Bros were makers of both the family scale and the Yankee screw driver.

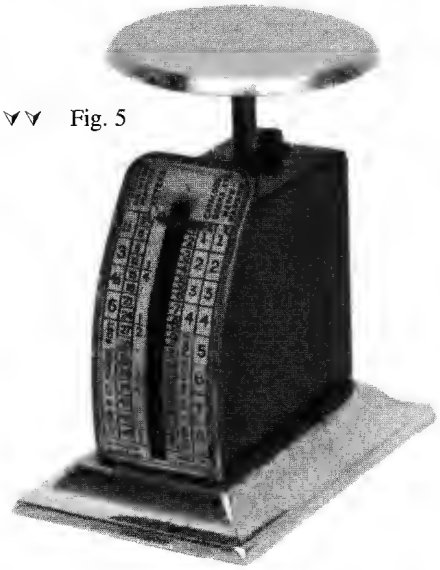


Fig. 5

Fig. 4

YANKEE No. 30 Ratchet Screw Driver (1910 model)

Fig. 6

Fig. 7a

Fig. 7b

Fig. 8

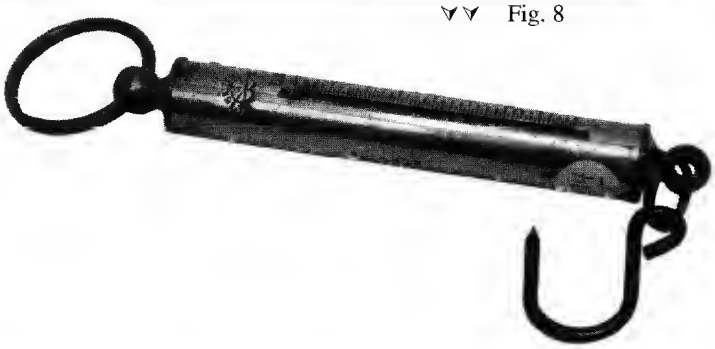


Fig. 9

Probably more Yankee screw drivers are found today than the US family scale.

Fireplace Jack - The George Salter Co is a household name in English made scales. One can readily associate that name with their many different scales, especially the spring balances (fig. 8). Well, the Salter line included lots of household tools and gadgets. Among them is a fireplace jack (fig. 9), a clever 19th Century device which hung in the fireplace and turned food slowly over the fire. The guts of the jack is essentially a clock movement wound by a key. The movement rotates a shaft fitted with a hook from which food or a utensil is hung. These gadgets are seen quite often in antique shops but most of the time I have found them made by other makers, not Salter. Perhaps this item was truly a minor line for Salter that relatively few were made and hence survived.

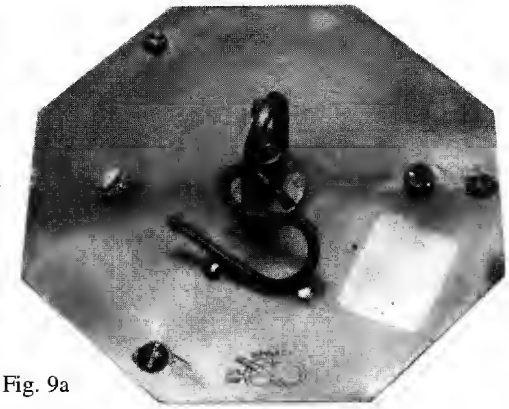


Fig. 9a

These are just a few examples of products made by companies that we know to be scale makers. I think it's a bit of history uncovered to know what else if anything some of these makers of scales made and sold commercially.

Accelerating Postals

BY M S ROBINSON

This year I have been lucky enough to handle two very unusual, large, postal, accelerating roberval scales, the first one (A) being in Ken Govier's collection and the second one (C) currently owned by myself. Although stamped with the names of two different famous makers, Vandome, Titfords & Pawson and DeGrave, Short & Fanner respectively, the eight design features that they have in common definitely suggest one maker.

Fig. 1. ⮝⮝ DeGrave, Short & Fanner (C) with the name stamped along the front edge of the letter-plate. The parallel curved beams show clearly. The straight round leg under the weight-plate is visible. The unusual and elegant A frame is distinct with its reversed trumpet shape. (The scale is mounted the wrong way round on its base - the weight-socket should be under the weight-pan.)

Fig. 2. ➢➢ Close-up of C, of the iron handle across the fulcrum. The block bearing under the fulcrum's pippin steel is visible. The distinctive curved edge of the weight-pan shows clearly. The decorative snecks on the A frame show. Behind the top of the A frame, the hexagonal nut spacer is visible.

They both reminded me of my absolute favourite roberval letter scale (E), bought many years ago at auction. It was made by DeGrave, Short & Fanner, and had an incomplete set of flat round stacking weights, that I was convinced were original. The denomination and oz were followed by ED (the meaning of which is currently unknown.)

Taking both scales, A and C, to Headington a few weeks ago, it was fascinating to find that Diana Crawforth-Hitchins had two more large examples, B and D, plus the small DeGrave, Short & Fanner, E, from my original collection. We had not seen iron handles or slotted domed nuts before: the centre of an appropriately large screwdriver was ground away to form a tool before dismantling could take place.

At first sight scale D appeared to be anonymous, but after a thorough clean by Andrew Crawforth, R Vandome, London, was found stamped on the base. Having handled hundreds of wood-based robervals, Andrew was very surprised to see such excessive wear (dents and bruises) on a domestic scale. So could it have been used commercially? Or used by the GPO?

Fig. 3. ⮟⮟ Another close-up of C showing the round steel bottom stays, both connected in the octagonal housing. The extended leg, on which the weight-pan rests, shows on the left.

Fig. 4. ⮟⮟ Another close-up of C, showing the weight socket, flat bottomed, lined with brown velvet.

Fig. 5. ⋏⋏ Close-up of the octagonal housing, just showing the slotted steel nut. See Fig. 6.

Interestingly, R Vandome did make scales before 1840, at which date the first Titford joined him in partnership.[1] So could Vandome have designed these sturdy scales in brass for commercial use initially? Then, with the advent of the Penny Post in December, 1839, maybe he sold them to the General Post Office as parcel/letter scales?

There is a gap in our knowledge of the form of scales used by the General Post Office [GPO] in the period between 1839,[2] when the Penny Post started, and 1851, when we have our first record of ladder scales being used by the GPO.

We know that DeGrave, Short & Fanner had the contract to make GPO ladder scales, so did they have the contract prior to 1851, but were they making these substantial robervals rather than ladder scales? There is no broad arrow or GPO stamp on our five scales, so this must remain as a hypothesis. Was the bruising a consequence of constant use by desk clerks in the GPO?

The overall construction of these robervals is so much more substantial than is normal on a wooden-based roberval intended for domestic use. Their construction suggests their origins lie with the commercial shop scales of the second quarter of the 19th century, rather than with the more lightly constructed scales intended for domestic use in the 1840s. Could this be because the GPO demanded scales rugged enough to withstand their handling by desk clerks?

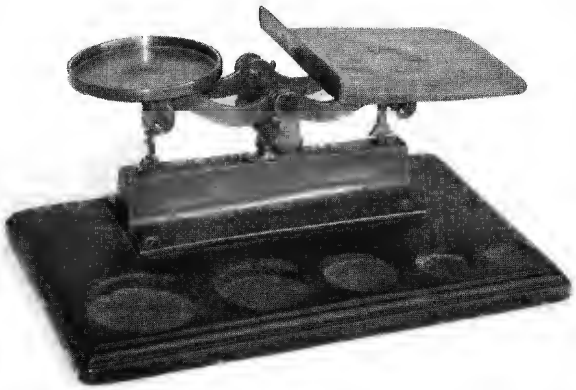


Fig. 7. ⋏⋏ The small DeGrave, Short & Fanner (E) showing the encased lower stays and the leg with its flared rest under the weight-pan. This was another method of resting the beam tipped to the left, so that it would accelerate to the right when a letter was loaded on. The curved beam and the iron handle are the same design as on the larger scales.

The scale B, by R Vandome, has its original base, but the base has no socket for weights, so the weights must have stood separately, as was normal on roberval shop scales before 1840. Scales A, C & D all have their weight sockets centrally positioned on the side of the base. This position is distinctly different from the normal domestic roberval postal with a wooden base, which have the weights at the front of the wooden base.

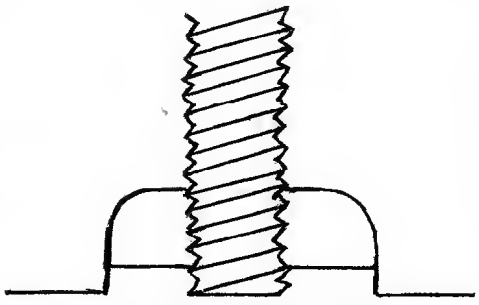


Fig. 6. ≺≺ Drawing of the very unusual slotted steel nut that holds the screw that comes through from behind. A feature of A, B, C and D.

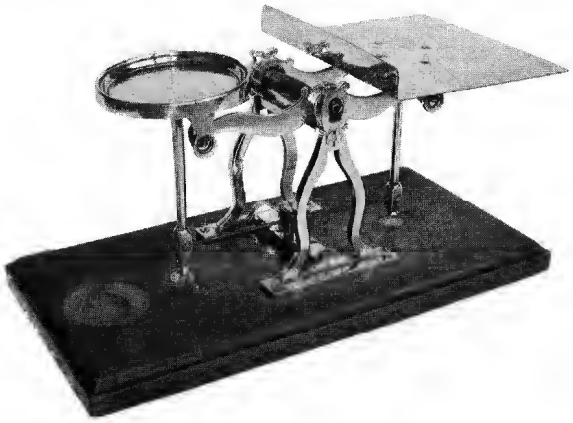


Fig. 8. ≺≺ R Vandome (D) showing the second design of A frame, the reversed tulip shape. Although it is different from the A frame in Fig. 1, it is equally elegant, and it might be considered to be by the same designer. Note the dotted design on the brass discs beneath the legs. Most makers used a domed "drawing-pin" as the brass disc. This large, flat design is not known on any other scales.

Fig. 9. ⮝⮝ R Vandome (B) with his name stamped along the front edge of the letter-plate, showing the third design of A frame, the shield-shape. Why has the base not got a weight-socket? The bottom stay is round brass rod.

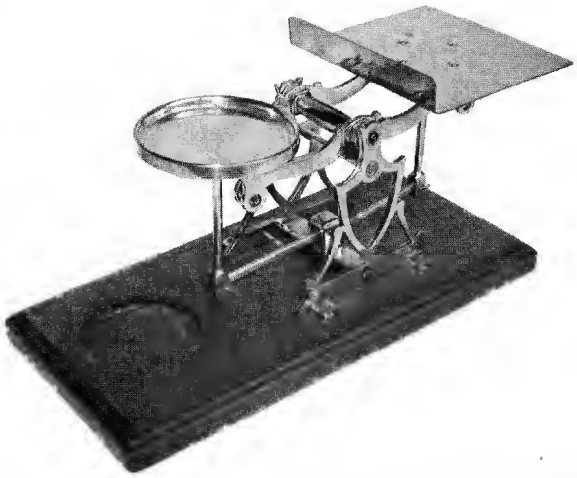


Fig. 10. ⮝⮝ Vandome, Titfords & Pawson (A) showing the same A frame as on the R Vandome (B) in Fig. 9. The bottom stay is oval and made of iron. The bearings at the bottom of the legs have been crudely replaced.

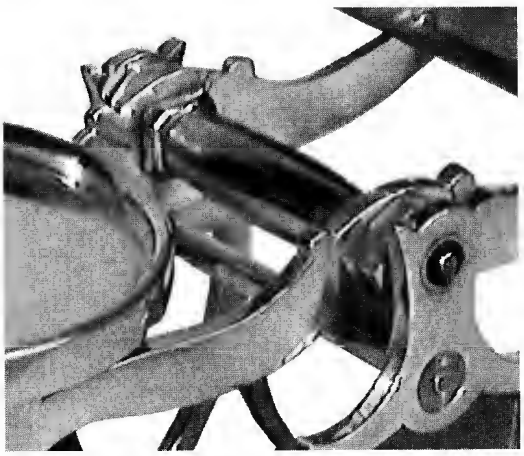


Fig. 11. ⮝⮝ Close-up of Vandome, Titfords & Pawson (A) showing the brace below the iron handle. The straight-sided weight-pan, the hex nut and the round bearing on the fulcrum are visible.

Could the reason for ours having their sockets in this unusual position be because the scales were for use in a GPO between two desk clerks' desks? We know that two GPO desk clerks shared the use of the 2oz preloaded anonymous GPO scales (see Fig. 12), that had a curved bracket to be screwed to the bar that joined two desks together.

The small scale E, by DeGrave, Short & Fanner, was made after 1845, when Fanner joined the firm. It has five weight sockets along the front, suggesting that it might have been intended for domestic use, in spite of its having similarities in construction with the four of the series above. It has the iron handle, so unnecessary on such a small scale, as no adult could get their fingers between the pan and the plate to carry it by its handle. It also has the curved beam, so unusual on English robervals for domestic use.

In an accelerating balance, once the intentionally slightly top-heavy beam and pan structure moves from its horizontal position because of the smallest excess weight, then the beam continues to accelerate away from the horizontal towards its extreme position where it stays.. (Note 4)

I should be very interested to hear from any member who can throw further light on the uses of these scales and perhaps name another manufacturer using similar construction methods.

Fig. 12. ➢➢ DeGrave, Short & Fanner beam made for putting between the desks of two GPO clerks. It is pre-loaded to 2oz.

Table showing the various features on the five accelerating postal robervals.

	A	B	C	D	E
Feature indicated by an 0	Van-dome, Titfords & Pawson, Govier Coll.	R Van-dome, (on plate,) MAC Coll.	De-Grave, Short & Fanner, London, MSR Coll.	R Van-dome, (on base,) MAC Coll.	De-Grave, Short & Fanner, London, ex-MSR Coll.
Iron handle across fulcrum	0	0	0	0	0
Accelerating beam (with leg under wt pan extended to rest on base)	0	0	0	0	0
Mahogany base	5 3/4 x 12	6 3/4 x 13	6 3/8 x 13	6 3/8 x 13	5 x 8
Straight legs below pan & plate	0	0	0	0	0
Brass hex nuts acting as washers across fulcrum	0	0	0	0	0
Bracee below handle fastened by slotted steel nut	0	0	0	0	--
Curved beam	0	0	0	0	0
Wt socket flat bottomed, lined with brown velvet	0	--	--	--	--
No wt socket	--	0	--	--	--
Wt socket 2" diameter with depression 1" diameter,			0	0	--
Wt socket lined with brown velvet	0	--	0	0	0
5 wt sockets, sockets 1.6ins diameter down	--	--	--	--	0
Brass disc below legs to prevent bruising of wood	--	--	--	0	--
Brace below handle, round	--	0	--	--	--
Brace below handle, rectangular section	--	--	0	0	--
Brace below handle, square section	0	--	--	--	--
Fulcrum in round bushed bearing	0	0	--	--	0
Fulcrum resting on dished rectangular block bearing	--	--	0	0	--
Bottom stays oval iron	0	--	--	--	Not seen
Bottom stay round iron	--	--	0	0	Not seen
Bottom stay round brass	--	0	--	--	Not seen
Bottom fulcrum in square housing	0	--	--	0	Not seen
Bottom fulcrum in octagonal housing sitting on round neck	--	0	--	--	Not seen
Bottom fulcrum in octagonal housing held by slotted steel nut	--	--	0	--	Not seen
Bottom fulcrum in square housing held by slotted steel nut	--	--	--	0	Not seen
Bottom brace below bottom fulcrum held by slotted steel nut	0	--	--	--	Not seen
Bottom brace below bottom fulcrum held by round peg	0	--	--	--	Not seen
Bottom brace below bottom fulcrum held by 2 round pegs	--	0	--	--	Not seen
Bottom brace below bottom fulcrum held by rect peg front & back	--	--	0	0	Not seen
Wt pan round, steep-sided, 3 1/2 ins diameter	0	0	--	--	--
Wt pan round, steep-sided, 2 1/2 ins diameter	--	--	--	--	0
Wt pan round, ledged & curved-sided, 3 1/2 ins diameter	--	--	0	0	--
Letter plate held by four domed rivets	0	--	0	0	0
A frame shield-shaped, 1/8 ins thick	0	0	--	--	--
A frame tall, reversed trumpet-shaped, 1/4 ins thick	--	--	0	--	--
A frame tall, reversed tulip-shaped, 1/4 ins thick	--	--	--	0	--
Pillar, French pattern	--	--	--	--	0
Decorative snecks on A frame	--	--	0	0	0

Notes & References

1. William and Arthur Titford and Henry Pawson started working in partnership in 1866.[1]

2. Referring to a date of 1839[2] implies that letters were not weighed before that date, but no such conclusion can be drawn. Letters of three sheets of paper or more were weighed and charged by the ounce well before 1800. We just don't know what type of scales was used.

3. Individuals in the DeGrave family are difficult to sort out. Probably DeGrave, Short and Fanner was started by Mary DeGrave (widow of Charles DeGrave Senior), with Samuel R Short and William Fanner.

4. This was the normal method of construction of most trade robervals, until about 1889 (see EQM 1638-1648), at which time vibrating beams were coming into use commercially. It wasn't until 1907 that the Regulations actually prohibited the use of accelerating beams for trade, with a ten-year leeway as they became inaccurate.

Author's Biography

Michael Robinson is the Chairman of ISASC (Europe). He started collecting scales in about 1970, with a particular emphasis on person weighers and roberval postal scales. He recorded all A frame designs on robervals that came his way, and now has an invaluable record tying makers to shapes. He used the knowledge gained on scales to do a little trading all over the UK between jobs restoring old buildings. As he has now retired to a small apartment, he is restricted to English iron weights and eye-baths, but that does not limit his travelling to obscure places to find and exchange rarities.

Acknowledgements

With grateful thanks to Diana Crawforth-Hitchins and Andrew Crawforth for their help with the above article.

Arc Scale Co, etc

BY J H BERNING

Arc scales come in several versions, and have interested me since we bought our first example, a postal version, nearly 20 years ago. Since then, we have bought 3 Arc Family Scales. Diana Crawforth-Hitchins brought the Arcs into focus by pointing out to me that we had one of the rarest forms of pendulum scale, one with two fulcrums. We discussed the patent and have endeavored to find examples of all variations, but have been thwarted in attempts to find two of the patent-types.

The patent, 340,181 of April 20, 1886, is exceptionally well written, being a model of clarity and allowing for many variations on the theme to be covered by the patent. Loren Witherell suggests its use in the family, the factory, the store or on the farm. Good commercial targets for a scale!

Fig. 1, Loren wrote, would be suitable for postage or drugs as drawn, or could be made with two fulcrums instead of one, and thus have graduations on both sides of the quadrant, and be marked on one side for postage and indicate pounds avoirdupois on the other side. Fig. 3, he wrote, shows another small form for household use, not exceeding 8lb capacity, but could have varied capacity by shifting the poise up or down the edge of the quadrant. He does not show his vision of a rugged

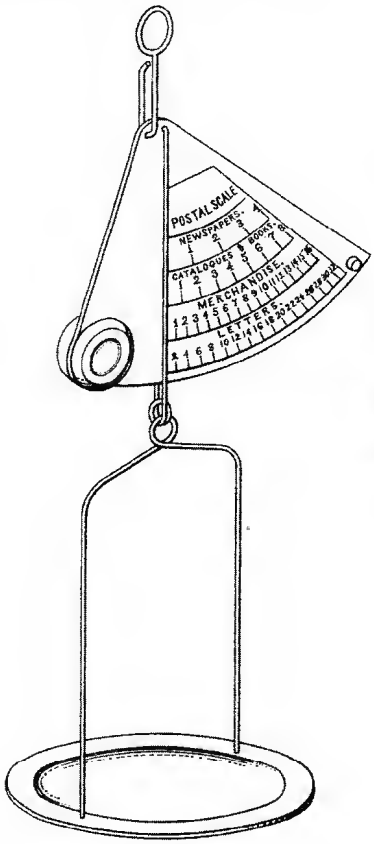


Fig. 1. ⅄⅄ Drawing from L R Witherell's patent 340,181, a Postal Scale of 2lb capacity, with postal rates on the label. The shape of the pan suggests other uses.

Fig. 2. ⅄⅄ The Arc nearest to the patent drawing in principle, is this fancy cast-iron version with a large iron poise with a hole in it, plugged with cork. It has an additional poise on the right corner, recommended by Witherell as a counter-balance. The cast lettering reads "Arc-Scale-Mfg. Co. Sole Manufacturers. Davenport, Iowa. Pat Apr '86". Capacity 25lb. 8¼ins high. Note that there is only one fulcrum with one ring to hold it up, and thus, only one set of graduations on the brass plate.

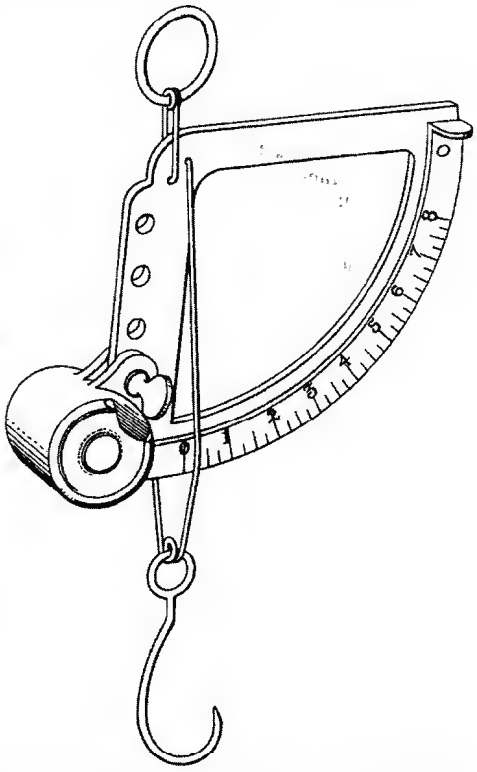


Fig. 3. ⅄⅄ Drawing from L R Witherell's patent 340,181, a household scale with a moveable poise. If the moveable poise was moved up the quadrant, the scale would need four sets of graduations, because the nearer to the fulcrum the poise is fixed, the smaller the load needed to lift it, so the wider the graduations would be.

Fig. 4. ⩓⩓ The second type of the fancy cast-iron Arc. It is very similar to the example in Fig. 2, but it has the special feature of Arc scales, two fulcrums, with two rings to hold it up by, and two sets of graduations, both on the same side of the quadrant. The cast-iron quadrant is strongly made, but Witherell did not construct the additions, the load-hooks and the rings, ruggedly. The capacity of the scale is 0 to 25lb and 24 to 50lb, but it would damage the scale to apply a 50lb load.

Fig. 5. ⩔⩔ The earliest sheet-tin type of Arc Scale, with a printed paper label reading "The Arc Family Scale The delight of every housekeeper. Manufactured exclusively by the Arc-Scale Company Davenport, Iowa. Patent Applied for. "Even before the patent was granted, Witherell was making his variation with two fulcrums that he referred to in the patent papers. The scale was suspended by the right-hand ring. The quadrant is 6¼ins high.

Fig. 6. ⩓⩓ The second sheet-tin type of Arc scale, with a printed paper label reading US Postage-Rate, ARC SCALE TELLS THE POSTAGE. MADE ONLY BY THE ARC-SCALE MANUFACTURING COMPANY DAVENPORT, IOWA, Patented April 20, 1886. ALWAYS HANG ON LEFT HAND RING. It is very unusual in having a label that has survived 120 years of handling. The additional hooks and rings are adequate for its capacity, 16oz to 64oz on the side shown, and 0 to 16oz on the other side. It is the less-common version, with only one heavy lead poise, and no counter-pose on the other corner. Witherell must have found that people got confused about which ring to use and added the instruction "Always hang on the left-hand ring".

pendulum scale, but the patent covers any capacity that can be lifted off the ground by hand or by using a lever!

Patent 340,181, (figs. 1 and 3) of April 20, 1886, was granted to Loren R Witherell, of Davenport, Iowa, assigned to Edward Russell, John N Greer & Henry B Harford of same place. Loren shows a simple arc for postal use and a movable poise version for household use. No double fulcrum shown but is mentioned in the text with the suggestion that one side should show one set of graduations, and the other side, a larger range of graduations. He suggests its use for any load that "can be lifted from the ground". I wonder why he didn't show the two-fulcrum version, which was made, but did show the movable poise, which wasn't made, as far as I know. Now we should look out for a version with several holes down the side. That would be exciting!

Patent 344,762, (fig. 12) of June 29, 1886, was granted to Loren R and Erie A Witherell for a Portable Scale for Weighing Vehicles, to solve the difficulty of bringing the loads to a stationary scale embedded in the ground. The brothers recommend the weighing of each wheel of the vehicle then the adding together of the totals to ascertain the weight of the vehicle (and its load if loaded). The patent was assigned to the Davenport Portable Scale Company, a company not found in searching the City Records. Was the company started to provide Erie with an income?

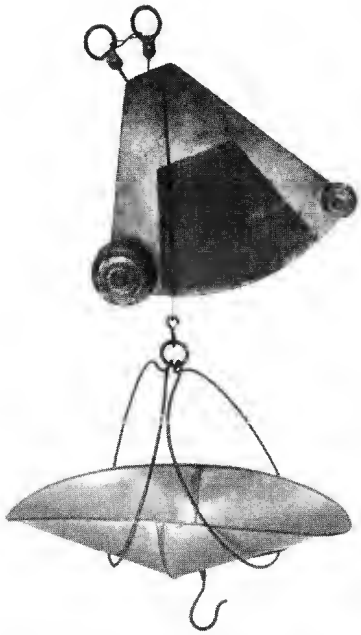


Fig. 7. ⮝⮝ The third sheet-tin type of Arc scale, with a printed paper label reading "THE ARC FAMILY SCALE. The Delight of Every Household. Manufactured expressly by Arc-Scale Co. Davenport, Iowa". Turn over balance with two suspender springs. Graduated one side 0 to 10lb x 1/2lb, other 4 lb x 1/4lb. Two loops hold a 10in brass scoop. Made later than the one shown in Fig. 5. The tin sheet is plated with brass. The right-hand ring was the correct one to support the scale!!

Patent 363,873, (figs. 13 and 14) of May 31, 1887, was granted to Eric Witherell alone, and half was assigned to John C McHart, also of Davenport. The continuous spring can be either a single spring or two springs coiled together to raise the capacity. The lower capacity, with a letter clip, is for a postal scale, and the higher capacity, with the scoop, is for "articles of such a character that they require a scoop".

Patent 373,326, (figs. 10 and 11) of Nov 15, 1887, was granted to Loren R Witherell alone, for the modification of his first scale patent, the Arc. The Plantation Weighing-Scale was the highest capacity Arc.

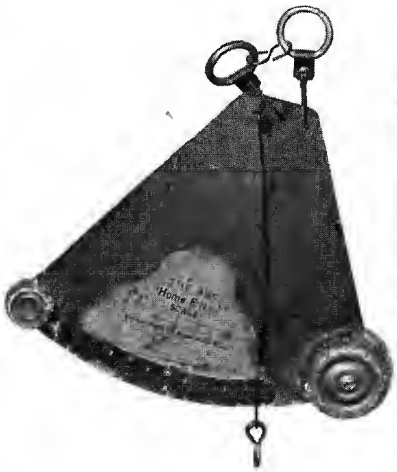


Fig. 8. ⮝⮝ The fourth sheet-tin type of Arc Scale, with a brass graduated plate screwed to the tin sheet. The heavy side is shown, with capacity 0 to 10lb. The light side shows capacity 0 to 4lb.

Fig. 9. ⮝⮝ The printed label of the example in Fig. 8, reading "THE ARC Home Friend SCALE, The delight of every housekeeper. Patented April 20, 1886. Always hang on right hand ring. Manufactured by the Arc Scale Mfg. Company, Davenport, Iowa."

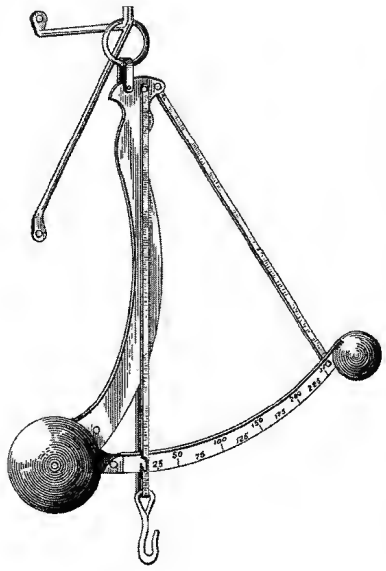
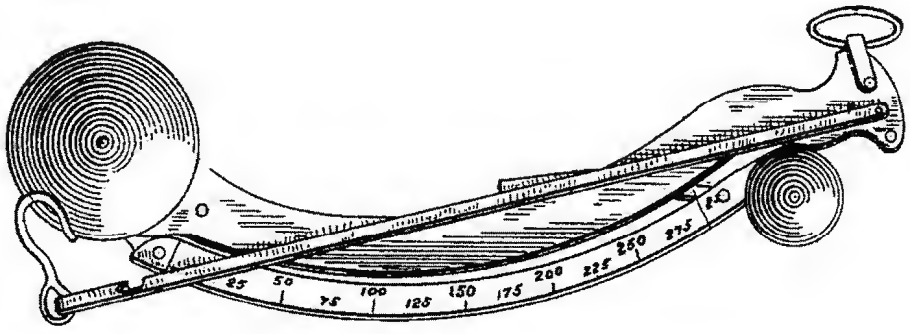


Fig. 10. ⮜⮜ The Plantation Weighing Scale was patented in the following year, as patent 373,326, to weigh loads of between 100 to 250lb, or more, yet could be folded up. Loren Witherell reverted to his first idea, of having only one fulcrum.

Fig. 11. ⮟⮟ The folded scale shown in Fig. 10. The bracket was permanently attached to barn or outhouse, so only the scale was portable. As Witherell made so many of his ideas, an example of this design might turn up one day.



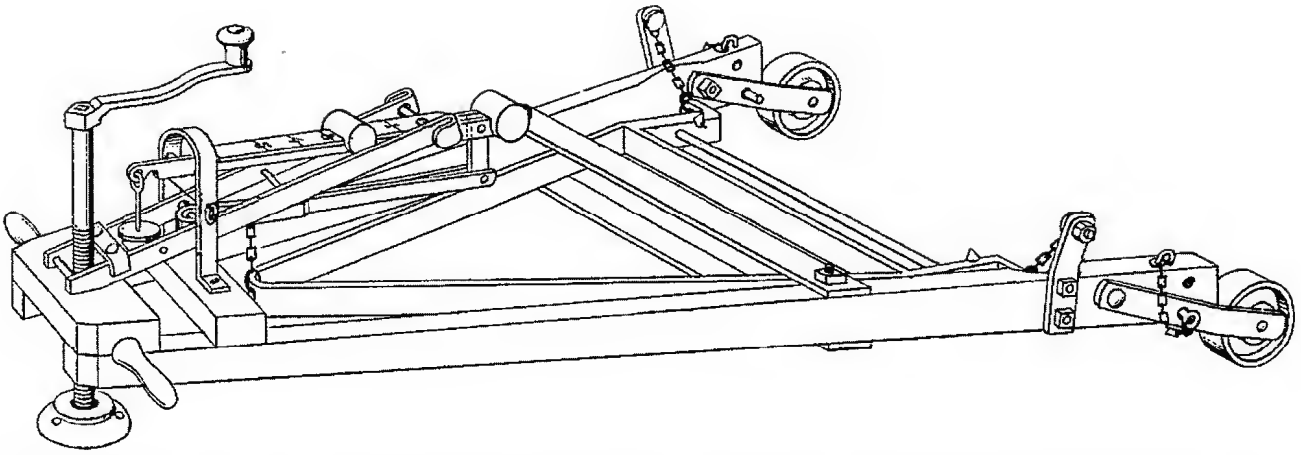
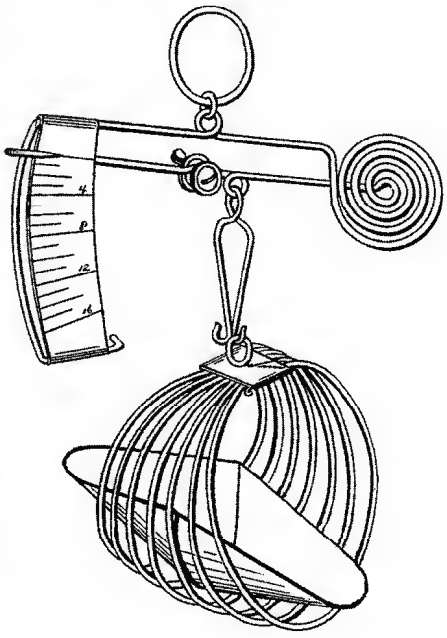


Fig. 12. ⩓⩓ This portable machine was invented two months after the Arc, as patent 344,762. The machine is a normal platform scale, but without the platform. The vehicle wheel being weighed rests in a cradle at one end of the steelyard, and at the other end of the compound levers there is a steelyard and hanging pan for supplementary poises.

The listings in the City Directories seemed so erratic and unlikely that Loren Witherell seemed an enigma until I found his life-story in *The History of Knox County*. Loren's father was a carpenter who moved to Knoxville, Illinois, in 1851, when Loren was eight years old. He had a conventional education in public schools until he was 18, then he had two invaluable years in a private school in Pennsylvania, that stimulated his academic abilities to the point where he was able to attend Lombard College, then train as an Attorney admitted to the Bar in 1871. This profession, that suited his talents so well, was interrupted by problems with his eyesight, so he became, for 30 years, a fruit-grower in the summer, and a lecturer in the winter. By 1901 he had abandoned lecturing, and instead wrote articles and editorials, poems and histories, and devised many musical instruments. All this time, from the age of 22, he was thinking about and patenting mechanical devices, all of which were put into production. He had been a Patent Agent as well as an Attorney at Law, and his skill in writing patents is very apparent when reading the Arc patent.

Fig. 13. ⩔⩔ Postal or household scale, patent 363,873, simple to construct and easy to coil into other shapes. The pan and holder shown on this patent drawing is very similar in design to the one shown in Fig. 7.



Among other things he invented a sugar-cane stripper, a door spring, a rubber stamp and printing wheels, a dusting brush, a window fastener, a clothes wringer, a corn popper and, best of all, in 1886, the Arc scale. He even had a large collection of curios, The Old Curiosity Shop, that he intended to leave to a public Park as a permanent attraction!

The City Directories and patent records show that Loren Witherell made some of his inventions himself. In 1877 he made window fasteners, by 1887 he was making brushes, and by 1888 the Arc Manufacturing Company was producing scales, patented in 1886. By 1891 the Arc Scale Co. was no longer recorded in the

Directories, so were all those Arc scales made in just six years' production?

The Witherell family had a penchant for starting companies. In April, 1886 Loren assigned his Arc patent to E Russell, J N Greer and H B Harford, the officers of the Arc Scale Manufacturing Company; in June, 1886 he and his brother, Erie, assigned their patent to the Davenport Portable Scale Company. The next year, his brother, Erie, assigned one half of his new patent to J C McHart, so we might guess that yet another company had been started. But which company made Loren's last scale patent, the plantation weighing-scale? It is a modified Arc, so, logically, it would have been made by the Arc Scale Company. Can this ever be proved?

Acknowledgements

With thanks to Bob Stein, Betty Wright, Diana Crawforth-Hitchins, and the Davenport, Iowa Library.

Notes & References

Stone's Davenport City Directory. H.N. Stone publishers, 1868-1924

1868-1872 No listing for Witherell

1873 Witherell, Loren R Attorney at Law, Real Estate, Pension and Patent agent. Office: Main St. NW corner Lynde, residence: Salter West side 6 South Park

1874-75 Attorney at Law and Real Estate Agent, residence: 1810 Grove

1876 City Numberer. Office: 219 Perry 2nd Floor, residence: 1934 Grove

1877 Window Fasteners. Residence: 1934 Grove

1878 No listing

1879 Not available

1880 Travel Agent. Residence: 1934 Bridge Ave.

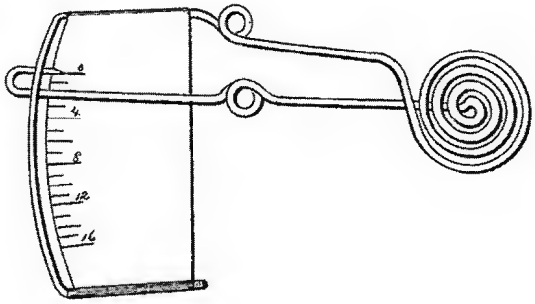
1881 Canvassing Agent, 1934 Grove

1882-1883 Scientific Lecturer, 1934 Grove

1884-1885 No listing

1885-1886 Scientific Lecturer. 526 E Locust

Fig. 14 ⋎⋎ Patent 363,873, postal or household scale. This is a different version of Erie's patent showing a variation of the scale frame shown in Fig. 13 above.



1887 Witherell & Hastings, residence Farnum & Limits, Witherell & Hastings (L R Witherell & B E Hastings proprietors), Davenport Brush Works, 411 & 413 Rock Island

1888-1889 Scale Manufacturers: Arc Scale Manufacturing Co., 411 & 413 Rock Island, Arc Scale Manufacturing Co. Edward Russell, President & Treasurer; Henry B Harford, Vice-President; John N Greer, Secretary and Superintendent. 411 and 413 Rock Island,

1890-1891 Witherell, Loren R, Proprietor, Mapledale Fruit Farm, Residence: ES Farnum nr Limits. Arc Scale Co. Arthur Atkinson Supt. 413 Rock Island, Arc Scale Co. J P Van Patten, Pres; H B Harford, Vice President; J B Fidlar, Treasurer; S M Reynolds, Secretary. 413 Rock Island

1892-1893 Witherell, Loren R, Scientific Lecturer & Fruit Grower, Locust NW corner Jersey Ridge Rd. (No listing for Arc Scale Co.)

1893-1894 Loren Witherell, Lecturer, Residence: NW corner Jersey Ridge Rd.

1895-1924 No listing for Loren Witherell or Arc Scale Co.

Census of the USA

1880 Census of USA 37 years old, -- Married to Lottie A.-- Born in PA

1910 Census of the USA Head of Household Trade Agent

Johann Langenberg Coin Scale

BY C MÖNNIG

From the collection of Herbert Griesshaber, Pfaffenweiler.

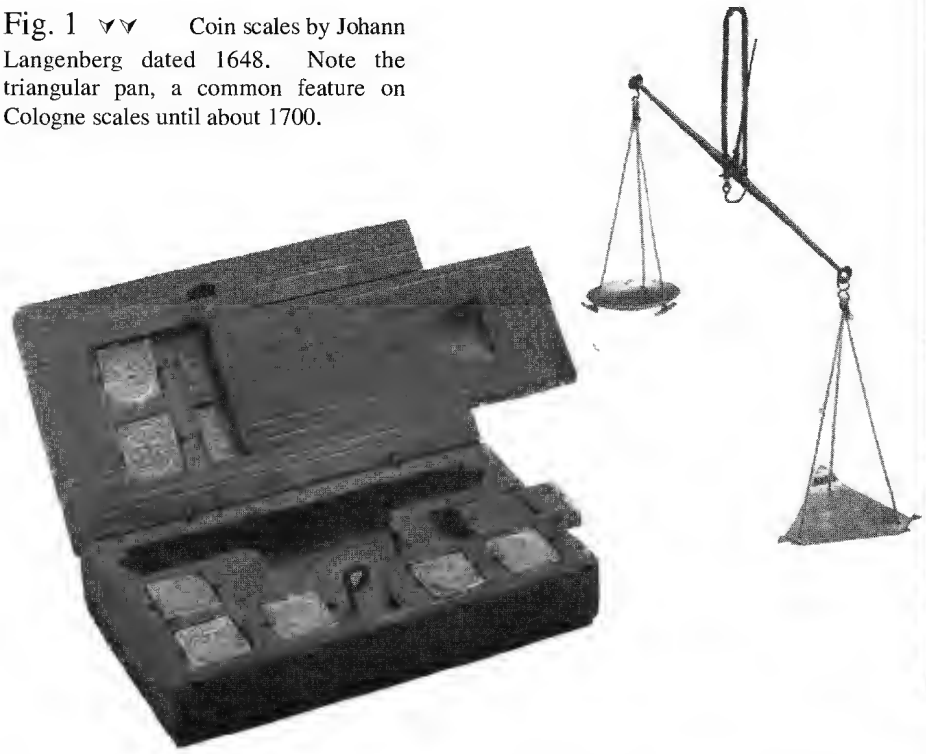


Fig. 1 ⋎⋎ Coin scales by Johann Langenberg dated 1648. Note the triangular pan, a common feature on Cologne scales until about 1700.

Fig. 2. ⋏⋏ Coin weights for the Rose Noble and the Pistolet showing the characteristic Cologne dots round the pictures.

The case is made of fruitwood, 122 x 67 x 22 mm, without a decorated profile, the top side of the cover decorated with stamped lines and a border, which are formed thus..... The box lid has simple wire hinges and a simple catch made from brass wire. Inside the cover is a sliding lid, under which are 8 pens for weights. The bottom part has a recess for the beam as well as one triangular and one round scale pan, 5 pens for weights and a pen for the grain weights, locked with a wooden lid. On the left, beside the pen for the pans is stamped a flower with two acorns. This ornament is also in a balance-box of 1644 by J de Backer of Antwerp. As the same balance-box by de Backer and a balance-box by Mattheis Mettmann from Cologne of 1652 have the same outside ornament on the cover, all three balance-boxes are surely made by the same maker. Over the pens for the weights the name of the coins is noted in black ink. On the top

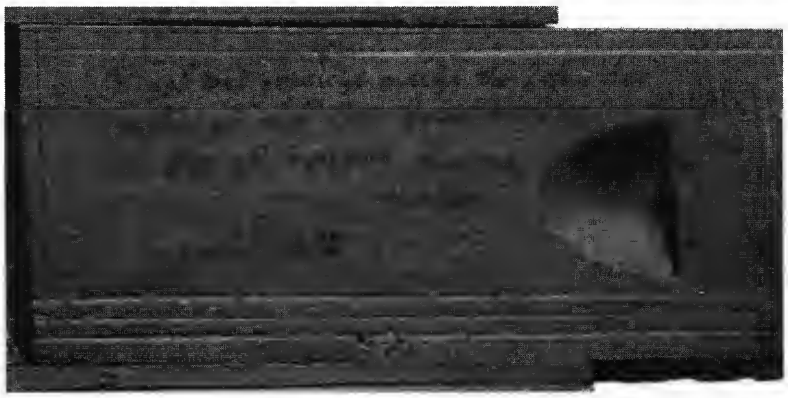


Fig. 3. ⋏⋏ The sliding lid inside the main lid, showing the hand-written label. *Wagh und gewicht macht Mr. Johan Langenburgh auf der briederstrass in der gl. Wagen Binnen Collen 1648.* The ink has remained amazingly legible for 350 years.

right in the lid is marked "Schifnobel", however in the pen lies an Angel weight.

Balance

In the base lies a delicate balance from iron with ends in trumpet form. The thin pointer has the typical base of many Cologne balances. On the delicate and slim fork hangs a pendant of wire. The triangular and round scale pans are of brass.

Weights

Under the small lid are three grain weights of different size. The 13 coin weights are cast out of brass and have pictures of the coins with dots round the edge in the style of the time and of Cologne coin-weights. The weights are each labeled as follows:

1. 7.6g. whole Rosenoble or Rosenobel, English gold coin made from 1343 until 1649.
2. 3.75g. Rosenoble or Rosenobel, English gold coin made from 1343 until 1649.
3. 3.0g. Crown, Staatencron, Staaten Krone. S K. Made by the State, during the 1577 second agreement in Brussels. King Philip II split. Netherlands coin.
4. 3.08g. Goldgulden, gold coin of the Middle Ages. The Hollandish Goldgulden weighs 3.27g. This weight of 3.08g corresponds with the Postulatgulden of the bishop R. v. Diepholt of Utrecht.
5. 5.0g. whole Angel, English gold coin first made in 1465 under Edward IV. This weight was made by Hollandish Michael den Drachen.
6. 2.5g. half Angel, English gold coin first made in 1465 under Edward IV. This weight was made by Hollandish Michael den Drachen.
7. 6.75g. whole Pistolet, Spanish gold coin.
8. 3.32g. half Pistolet, Spanish gold coin.
9. 3.4g. Langcruzde, Langkreuz. Cruzado with Cross of Calvary, Portuguese gold coin. The initials KD perhaps signifies the cross Daler of popular designation
10. 4.45g. whole Albertin, gold coin of the Spanish Netherlands under the rule of Albert and Isabella, made from 1600 until 1610.
11. 2.20g. half Albertin, gold coin of the Spanish Netherlands under the rule of Albert and Isabella, made from 1600 until 1610.
12. 7.00g. Hollandish Dukat, Dubbeldukat.
13. 3.46g. Hollandish Dukat.

Evaluation

This is a beautiful, well-received and complete coin-scale of the Cologne School by Johan Langenberg, from whom few examples survive.

Literature:

Kisch, Dr. B, *Gewichte- und Waagemacher im alten Köln*
Witte, A de, *Deneraux et leurs ajusteurs aux Pays-Bas Méridionaux*
Dieudonné, A, *Manual des Poids Monétaires*
Houben, G M M, *Muntgewichten voor Munten van de Nederlanden*
Houben, G M M, *European Coin-weights for English Coins*
Klimpert, *Lexikon der Masse, Münzen und Gewichte*
Kroha, T, *Lexikon der Numismatik*

Author's Biography

Carl Mönnig was an enthusiastic collector of artefacts associated with the history of the city of Cologne. He was immensely proud of his city, and took visitors to see all the best sites. He widened his interest to include the area around Cologne, so he knew a lot about the scales of the Mark and Berg States. He was a talented artist, and saw the finest details on his scale-boxes. He was cultured and charming, so his death was a great blow to his many admirers and friends.

US Patents, 1886-1888

TEXT BY R HENDRICKS WILLARD
CAPTIONS BY J H BERNING

Figs. 1. ⮝⮟ P. Everitt's patent no. 336,042 of Feb. 9, 1886. This is the only Fairbanks made, Everitt's patent scale known to exist. It stands in the basement of the Fairbanks Museum in St. Johnsbury, VT. Prior to obtaining a patent in the US, Everitt had obtained patents in England, France, Germany, Belgium, Australia, Tasmania, Luxemburg, Spain, Italy, India, Austria-Hungary, and several other countries.

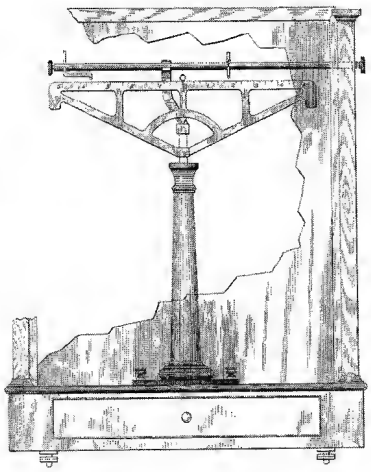


Fig. 2 ⮝⮝ E Becker's patent no. 336,546 of Feb 23, 1886. The inventor was primarily patenting his mounting and case for these fine scales. This is probably the earliest glass cased analytical balance patent.

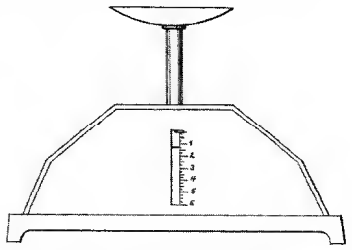
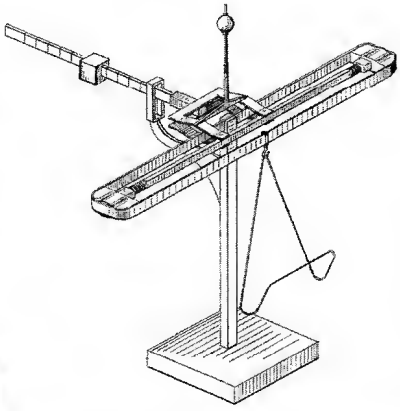


Fig 3. ⮝⮟ W R Watt's patent no. 338,894 of Mar. 30, 1886. This spring scale was designed to be inexpensive and simple to manufacture. Its one unusual feature is a single bow spring with a roller or wheel at each end. As a load is applied to the plate, the spring flattens out and the rollers move across the bottom of the scale. The potential for inaccuracies due to friction is great due to the fact that the vertical rod travels in grooves inside the housing.



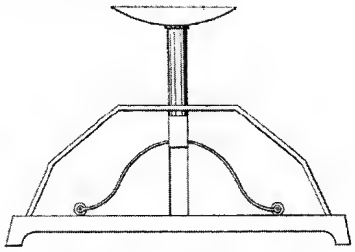


Fig 4. ⮜⮜ A Springer and F A Roeder's patent no.339,946 of Apr. 13, 1886. A steelyard torsional balance in which a single beam, with sliding weight, is combined with a fulcrum and terminal pivots.

Early in 1886, Korekiyo Takahashi, who was soon to become the first Commissioner of Patents of Japan, arrived in Washington to study the US Patent Office system and procedures. Over the next several months he was shown every courtesy and provided with a copy of every Patent Office publication, notice, circular, etc., that was still available. Toward the end of his stay he was asked why the Japanese people wanted a patent system. He responded that ever since 1854, when Commodore Perry opened the ports of Japan to foreign commerce, they had been trying to become

one of the great nations of the earth. They considered the United States, though not much more than a hundred years old, to be one of the greatest nations on earth and they believed that the U. S. patent system, which allowed individuals to profit from sharing their inventions, was responsible. "We will have patents," he said. Japan soon got its patent system. In 1921, having been made Prime Minister of Japan, Takahashi continued advocating economic rather than military competition with the Western powers. His beliefs were to cost him his life. In 1936 he was assassinated by a group of young officers to get him out of the way of the military faction that was preparing for World War II.

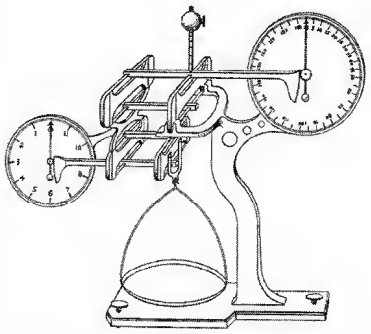


Fig 5. A Springer and W Kent's patent no. 383499 of May 29, 1888. This torsion balance was designed to give weight as well as price, making it a computing torsion balance.

Exciting things were happening in the USA while Takahashi was here. By 1886 the railroad system, which first became transcontinental in 1869, provided direct rail connections to the east coast from nearly every west coast city. It extended all the way from Seattle, Washington to San Diego, California. In addition, the invention of the induction telegraph facilitated the communication between trains and stations thus avoiding the frequent accidents that had been plaguing the railroads. In 1888, the Statue of Liberty was erected in New York Harbor amidst great celebrations and a dedication.

Many new technologies were invented during this period. George Eastman perfected the Kodak hand camera, the x-ray was invented to help in the field of medicine, and music saw the invention of 70 to 77 revolutions-per-minute records.

The most significant change in scale patents granted for the 1886 to 1888 time frame was the introduction of coin-operated, or coin-freed, person, weighing machines. These were not initially American inventions. By 1884 an Englishman, Percival Everitt, had invented a scale and several other automatic machines that he patented throughout the British Commonwealth, France, Germany, Austro-Hungary, Belgium, and elsewhere. Everitt was among the British inventors who came to the US to take advantage of the enormous and growing market and the ease with which impecunious inventors could patent their inventions here. He took a sample of his coin-controlled scale to E. & T. Fairbanks, one of America's leading exporting companies, in St. Johnsbury, VT. Typical of the times, the mechanism was housed in a boxy wooden case. Fairbanks produced the scale (1885-1886)-thought to be the earliest coin-op scale produced in the U.S.A.

Only a year later, in 1886, Blauvelt, Jay, and Blauven made the first American cast-iron, coin-operated scale. From this modest beginning, an enormous industry developed. By the middle 1890s American coin-operated machines, mostly scales, had found a world market with dozens of models to be seen wherever people congregated-primarily in transportation terminals at first but later on street corners everywhere so that pedestrians could weigh themselves. Some of these large scales also printed a ticket so the user could keep a record of his weight.

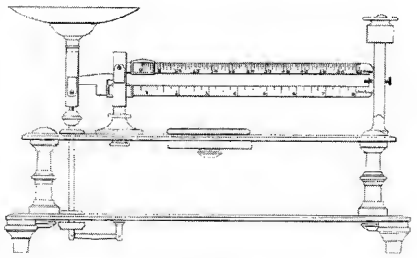


Fig 6. CII Fitch's patent no. 384,247 of June 12, 1888. This design can be disassimbled to fit into a box for portability.

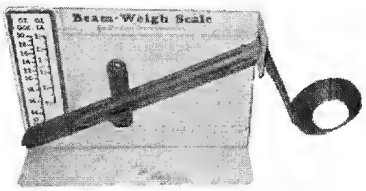
Notes & References: See EQM 2423-2435, 2457-2463, 2493-2496.

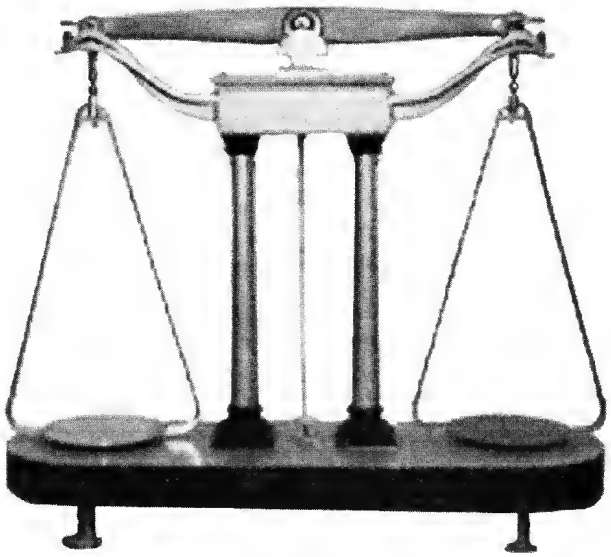
Patents sorted by date, (shop/warehouse platform scales and smaller). 1886-1888

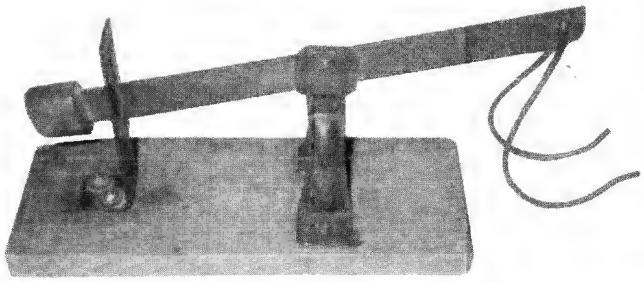
NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
334,288	Jan 12, 1886	E L Rowe	Lansingburg, NY	Rensselaer Mfg Co	Union scale
336,042	Feb 9, 1886	P Everitt	London, England		Coin freed weighing machine
336,043	Feb 9, 1886	P Everitt	London, England		Ticket printer for weighing machines
336,275	Feb 16, 1886	T B Willson	Chicago, IL		Letter scale
336,472	Feb 16, 1886	G W Craig	Grimm's Landing, WV		Platform scale improvement
336,546	Feb 23, 1886	E Becker	New York, NY		Analytical Balance
336,641	Feb 23, 1886	D Hallock	New York, NY		Multi fulcrumed scoop scale
337,772	Mar 9, 1886	J A Knowles, Jr	Lowell, MA	W H Thompson	Counterpoise set for beam scale
338,266	Mar 23, 1886	R L Hassell	Chicago, IL		Scale beam with dial indicator
338,522	Mar 23, 1886	C W Hastings	Brooklyn, NY		Electro-magnetic poise adjuster
338,535	Mar 23, 1886	C R Maguire	Baltimore, MD		Plated detachable front plate for hanging spring scale
338,654	Mar 23, 1886	J Ball	Waterloo, Canada		Single plate box scale
338,894	Mar 30, 1886	W R Watt	Somerville, TN		Spring balance
339,946	Apr 13, 1886	A Springer & F A Roeder	Cincinnati, OH	US Torsion Bal & Sc Co	Torsional pivot balance
339,947	Apr 13, 1886	A Springer & F A Roeder	Cincinnati, OH	US Torsion Bal & Sc Co	Torsion counter scale
340,006	Apr 13, 1886	F A Roeder	Cincinnati, OH	US Torsion Bal & Sc Co	Torsion Balance
340,007	Apr 13, 1886	F A Roeder	Cincinnati, OH	US Torsion Bal & Sc Co	Torsional pivot balance
340,008	Apr 13, 1886	F A Roeder	Cincinnati, OH	US Torsion Bal & Sc Co	Torsional pivot balance
340,010	Apr 13, 1886	A Springer	Cincinnati, OH		Molecular pivot balance
340,011	Apr 13, 1886	A Springer	Cincinnati, OH		Molecular pivot balance
340,012	Apr 13, 1886	A Springer	Cincinnati, OH		Molecular pivot balance
340,013	Apr 13, 1886	A Springer	Cincinnati, OH		Torsional pivot balance
340,181	Apr 20, 1886	L R Witherell	Davenport, IA	Russell, Greer & Harford	Hanging quadrant scale
341,166	May 4, 1886	J E Pitrat	Gallipolis, OH		Price indicating coupling for scale beam
341,269	May 4, 1886	J Ohlweiler & E Struppe	Milwaukee, WI		Beer weighing scale
341,270	May 4, 1886	J Ohlweiler	Milwaukee, WI	1/2 to & E Struppe	Beer weighing scale
342,550	May 25, 1886	T H Ward	Tipton, England		Hanging spring balance
344,857	Jul 6, 1886	J E Pitrat	Gallipolis, OH		Weight & Price scales
345,049	Jul 6, 1886	H Haerter	New York, NY		Spring bal with adjustable tare
346,017	Jul 20, 1886	N W Austin	Newport, KY		Weight & Price scales
347,056	Aug 10, 1886	P H O'Neill	Brooklyn, NY		Beam scale with stationary counter poise
349,570	Scpt 21, 1886	M G Cook	Ashfield, MA		Beam scale with indicating dial
351,274	Oct 19, 1886	C R Maguire	Baltimore, MD		Scale pan for spring balance
351,528	Oct 26, 1886	W W Reynolds	Rutland, VT		Scale for weighing in 2 standards
352,753	Nov 16, 1886	L M Hosea & A Springer	Cincinnati, OH	US Torsion Bal & Sc Co	Molecular pivot balance
356,077	Jan 11, 1887	J E Pitrat	Gallipolis, OH		Weight & price scale
357,139	Feb 1, 1887	M Attwood & H R Taylor	Saucelito & Oakland, CA	Attwood to Taylor	Chemist's, Assayer's, prospector's balance
357,658	Feb 15, 1887	F M Ferrell	Toccopola, MS		Scale beam
359,187	Mar 8, 1887	S H Stevens	Chicago, IL		Scale for ascertaining % of impurity in grain
360,073	Mar 29, 1887	J R Wilkinson	Atlanta, GA		Pendulum scale
360,309	Mar 29, 1887	L Langdon	Stockton, CA		Adjustment for spring scales
361,246	Apr 12, 1887	T A Weber	New York, NY	B S Bennett	Coin freed person weighing scale
361,275	Apr 19, 1887	E S Enyart	Ottawa, IL		Electric signal for platform sc
362,628	May 10, 1887	A A Houghton	Buffalo, NY		Covered equal arm balance scales
362,748	May 10, 1887	H C Kebler	Ogden, UT		Indicating attachment for scales

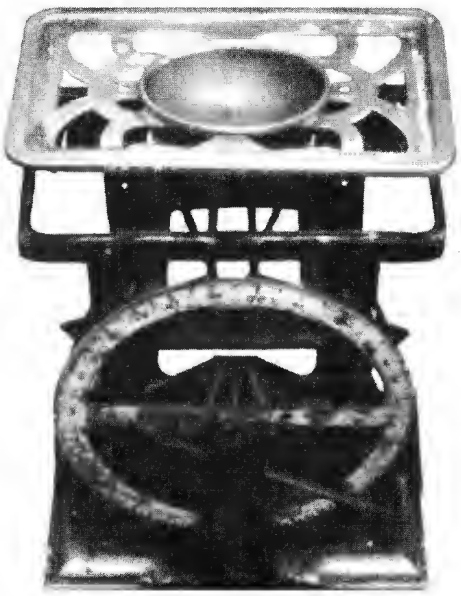
NO.	DATE	INVENTOR	RESIDENCE	ASSIGNEE	TYPE
363,468	May 24, 1887	W Kent	Jersey City, NJ	Torsion Balance & Scale Co	Precision torsion balance
363,873	May 31, 1887	E A Witherell	Davenport, IA	1/2 to J C McHart	Spring balance
364,478	June 7, 1887	G H Chatillon	New York, NY		Scale face concealing mechanism
365,170	June 21, 1887	E O Deming	San Francisco, CA		Device for disengaging scale beam
365,353	June 21, 1887	W R Smith & A L Washburn	Bandera, TX & NY, NY	Washburn to Smith	Electric coin operated scale
366,303	Jul 12, 1887	C C Clawson	Newark, NJ	U S Mach. & Inventions Co	Coin operated ticket scale
366,491	Jul 12, 1887	C R Maguire	Baltimore, MD		Case improvement in spring scales
366,753	Jul 19, 1887	A A Armitage	Kenesaw, NE		Combination hand truck & scale
367,429	Aug 2, 1887	F C Moore & J C Thompson	Grinnell, IA		Combination scoop & scale
367,542	Aug 2, 1887	C J Mikesh & H W Conant	Sheldon, IA		Egg tester & register
369,073	Aug 30, 1887	H Paddock	St. Johnsbury, VT		Coin-op weight & height scale
371,071	Oct 4, 1887	W C James	Boston, MA		Combination hand truck & scale
371,869	Oct 18, 1887	E R Whitney	Manchester, NH	The Standard Electric Co	Coin operated electric scale
371,920	Oct 25, 1887	A C Both	Portland, ME		Spring letter scale
372,538	Nov 1, 1887	W C James	Boston, MA		Combination hand truck & scale
373,326	Nov 15, 1887	L R Witherell	Davenport, IA		Folding plantation scale
373,568	Nov 22, 1887	C Richtmann	Newark, NJ		Quadrant letter scale
374,013	Nov 29, 1887	J E Tarbox	Lynn, MA		Electrical indicator for scales
374,759	Dec 13, 1887	J F Segog	Duluth, MN	1/2 to M E Gleason	Spring weighing measuring vessel
375,102	Dec 20, 1887	W R Smith	New York, NY		Coin operated scale
376,042	Jan 3, 1888	H Paddock	St. Johnsbury, VT	E & T Fairbanks	Platform sc adjustable bearings
376,910	Jan 24, 1888	G Reimann	Berlin, Germany	Naehmaschinen Fabrik	Dial rotating coin operated scale
378,382	Feb 21, 1888	A Turnbull	New Britain, CT		Counter top platform scale
379,746	Mar 20, 1888	W R Watt	Somerville, TN		Boxed pocket scale
379,858	Mar 20, 1888	C C Clawson	Newark, NJ	U S Mach. & Inventions Co	Coin operated ticket scale
379,859	Mar 20, 1888	C C Clawson	Newark, NJ	U S Mach & Inventions Co	Coin operated height weight scale
380,826	Apr 10, 1888	E Staub	Leipsic, Germany	G Thomas	Yarn balance
380,837	Apr 10, 1888	T A Weber	New York, NY	National Weighing Mach Co	Coin operated scale
381,087	Apr 10, 1888	A H Smith	Memphis, TN		Steelyard
381,338	Apr 17, 1888	C C Clawson	Newark, NJ	U S Mach. & Inventions Co	Coin operated musical ticket scale
381,339	Apr 17, 1888	C C Clawson	Newark, NJ	U S Mach. & Inventions Co	Coin-op weight printing scale
381,673	Apr 24, 1888	J B Butenschon	Portland, OR		Housed counter scale
383,499	May 29, 1888	A Springer & W Kent	Cincinnati, OH & Passaic, NJ		Weight & price scale
384,247	June 12, 1888	C H Fitch	Poultney, VT		Prescription balance
384,256	June 12, 1888	H J Henrichson	Cincinnati, OH		Hanging scale pan
385,005	June 26, 1888	J E Pitrat	Gallipolis, OH		Weight & price scale
385,635	Jul 3, 1888	C P Lancaster	Fairmount, IN	L Scott & J H Winslow	Computing price chart for sc beam
385,900	Jul 10, 1888	E H Amet	Chicago, IL	H A Streeter	Ticket printing person scale
387,285	Aug 7, 1888	H Fairbanks	St. Johnsbury, VT		Indicator for coin operated scales
387,565	Aug 7, 1888	J Moss	Brooklyn, NY		Coin operated scale
387,842	Aug 14, 1888	E H Amet	Chicago, IL	Himself & H A Streeter	Coin operated ticket scale
387,931	Aug 14, 1888	A Taylor	Toronto, Canada	1/2 to W Stone	Platform scale
388,138	Aug 21, 1888	E Knight	Saybrook, CT		Letter scale & coin tester
389,076	Sept 4, 1888	T H Herndon	Birmingham, AL		Self indicating platform scale
389,223	Sept 11, 1888	G P Hill & A L Washburn	Niantic, CT	1/2 to N S Perkins	Coin operated scale
390,522	Oct 2, 1888	T B Salter & J Hughes	West Bromwich, England		Hanging spring scale
391,453	Oct 23, 1888	E G Collins	Kenesaw, NE		Combination hand truck & scale
391,513	Oct 23, 1888	E J Colby	Chicago, IL	Colby Testing Machine Co	Coin-op scale & testing machine
392,617	Nov 13, 1888	C A Lieb & E Lavens	New York & Brooklyn, NY	E Lavens to C A Lieb	Beam suspension improvement

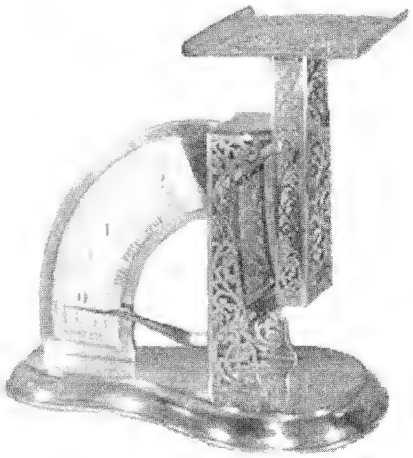
Showcase











Top Left. "American Beam Weigh Scale." Red and white tin egg grading scale for determining the ounces per dozen and ounces per egg. It is marked The Russell Orris Company Macedonia, Ohio and measures 6¼" wide by 4½" tall by 3"deep. This scale is patent number 2,056,997 by R.O. Bate on October 13, 1936. Collection B. Jibben.

Top Right. Bullion balance made by Henry Troemner. It stands 30⅕" tall with a heavy cast iron base. Collection G. A. Wehman.

Center Left. Unsigned American egg scale with a natural wood base with a brass beam and lead poise. Bismar with moving piviot point to weigh eggs weighing 15 and 21 ounce per dozen. Beam is 8" long. Collection B. Jibben.

Lower Left. American filigree postal scale. Marked "Sterling and Other Metals", "Pat. 2-23-04 USA and Abroad", "Black, Starr & Frost" ,"1794L". The patent date indicates that it is patent number 752,874, by J.M. Triner. Collection P. Laycock.

Lower Center. English postal scale made for the American market. It is 7½ins high, made of flimsy pressed brass, with lacquered panels and black lacquer over the watered silk pattern on the tube. Collection D Crawforth-Hitchins.

Lower Right. Egg scale of unknown German manufacturer. patented 1911. Graduated by tenths of a gram up to 20, then by ½ gram to 350. The plate is indented to hold an egg but the scale can also be used for a letter. Collection B. Tope & P. Laycock.